NUTRITION In Health and Disease

NUTRITION

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In Health and Disease

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Preface

The 13th edition of *Nutrition in Health and Disease* presents nutrition principles based on the most recent findings and concepts, and suggests applications for putting this information to work. Emphasis is laid on the part that the nurse can play in promoting better nutrition for all people, and particularly on her role at the patient's bedside in implementing the dietary treatment of disease This text also meets the needs of general college students in a [illegible]

ment the text

The 1958 Recommended Daily Dietary Allowances prepared by the Food and Nutrition Board of the National Research Council are used for reference throughout this edition

Part One deals with the nutritional needs of various ages and groups, the foods which will supply these needs, and the fate of these foodstuffs in the body New concepts of fat metabolism, the possible significance of unsaturated fatty acids and their distribution in common foods are discussed in Chapter 3. New bar charts in Chapters 4, 6, 7 and 8 show the distribution of nutrients in common foods classified in the four food groups now commonly used for teaching purposes. A new table of energy expenditures for everyday activities of the mid-20th century replaces outmoded material. The reduction of caloric needs with each decade for adults of different weights is also given in tabular form. Geriatrics is given special emphasis in Chapter 15, recognizing, of course, that the foundation for good nutrition in later years is laid in good food habits acquired earlier in life.

Food and the Public Health, Chapter 16, is completely new, written by Warren Averill, Ph D , Assistant Professor of Food Technology, University of Massachusetts. Dr Averill gives an interesting and concise review of the latest information on food-borne infections, food poisoning, spoilage, deterioration and modern methods of food preservation which conserve the values and the attractive appearance of food. The problem of food additives is discussed briefly, as well as the Federal and the state laws which protect the public against fraudulent and misleading claims and against contamination.

Part Two, *Diet in Disease*, is introduced by a new chapter entitled "The Patient and His Nutritional Problems." This chapter is concerned with the patient as a person, his attitudes toward food, feeding problems and his dietetic care. The subsequent chapters on diet in relation to specific disease syndromes have been thoroughly revised, with some sections completely rewritten. Low fat, low cholesterol diets for atherosclerosis, the gluten-free diet for treatment of sprue and celiac disease, the special diet for the dumping syndrome, and special diets for cardiospasm, hiatus hernia, kidney stones and pancreatitis have

been added. Formulas and directions for preparation of new varieties of tube feedings are given Recent developments or discoveries such as ammonium poisoning in liver failure, Orinase in the orally administered therapy of diabetes and the significance of the hormone glucagon are also discussed. The chapter dealing with diet in diseases of children has been greatly expanded.

Part Three, pruned for increased efficiency, nevertheless includes new gluten-free recipes (Chap. 50), and other new recipes have been added to Chapters 49 and 50.

Part Four has been revised and condensed Out-of-date tables have been deleted, a new table of the sodium and potassium content of foods and seasonings has been substituted, and the table of blood constituents has been revised, with the addition of urinary constituents indicating the nature of pathologic changes.

Special attention is called to the carefully selected and refreshed bibliography for supplementary reading which includes both general references and more specific readings classified according to subject The latter group will be especially helpful to the advanced student. At the other extreme, professional people may find the list of more casual reading for the lay person (sub-listing under General References) of some convenience in replying to queries of a non-professional nature.

The *Overseas Supplement* accompanies all copies of the book sent outside North America. This supplement provides suggestions as to how this text can be adapted for use in countries where the foods and the food habits are quite different from those in the United States. References in the Supplement list sources of information about foods common to various parts of the world.

The teacher's guide, entitled *Teaching Nutrition in Nursing*, by Hendenka J. Rynbergen, was completely revised in 1956 for use with the 12th and the 13th editions of the text This manual contains outlines for lesson plans and suggests appropriate methods, topics for emphasis and related activities in each subject matter area, with special attention to an integrated approach in teaching diet in disease.

The authors have kept in mind not only the needs of the nursing student in basic programs but also those of the graduate nurse, the dietitian and the college instructor with the hope that the book's primary assets as a text will ensure its usefulness as a reference as well.

Acknowledgments

The authors wish to express their deep appreciation to their many friends and associates for advice given and time spent in reviewing and revising the manuscript for the 13th edition. Special thanks are due Miss Marjorie Heseltine, Nutrition Specialist in the United States Children's Bureau, for assistance with Chapters 12, 13 and 14, Warren Averill, Ph D., Associate Professor in Food Technology, University of Massachusetts, for writing Chapter 16, Food and the Public Health, and several physicians and the Department of Nutrition at The New York Hospital–Cornell Medical Center, for much helpful advice.

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PART ONE

Principles of Nutrition

Part One deals with the Principles of Normal Nutrition and their application to all age and sex categories.

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CHAPTER ONE

Nutrition for Health and Growth

NUTRITION TODAY

The subject of nutrition is as old as man's search for food, but the science of nutrition is new. We have today a wealth of scientific knowledge about food with fresh concepts and applications Knowledge of how we use food to nourish our bodies is the result of long years of research in laboratories in many countries, but this alone is not sufficient Knowledge must be put into action not just by doctors who may prescribe special diets but by every homemaker who cares about the health of her family. Experts apply new discoveries in electronics so that we may enjoy TV by merely pushing a button, but there is no push-button application of nutrition. In contrast, the practical application of new discoveries in nutrition must be made by everyone who chooses his own food.

Many professional groups are helping others to understand how to benefit by nutrition knowledge the doctor who prescribes special diets for his patients, the nutritionist who teaches others how to apply nutrition in everyday meal planning, the dietitian who plans and supervises meal service in hospital, school or factory cafeteria, the nurse who sees that her patient is served the [illegible]

provide not only *for minimum requirements* but also for the variations from the "normal" both in health and in disease, and for some margin of safety to [illegible]

rity. The well-nourished individual is alert mentally and physically, has a wholesome and optimistic outlook on life, has good resistance to infections

and shows numerous other signs of good health.

Not only can good nutrition contribute to everyday health, but the life span may be increased by extending the active and vigorous period of life. By using animals with a shorter life span than man, Sherman proved, by carefully controlled experiments on 27 generations of rats, that good diet could extend the life span by 10 per cent

The real job of planning for health and efficiency of future generations depends upon the formation of good health habits in today's children Inheritance may account for tall parents' having tall children, but there is also the probability that the foods which make for growth were served habitually in those households

NUTRITION THROUGH THE AGES

Food always has been recognized as one of the most vital necessities of life. Man's interest in its nutritive values began before the dawn of civilization, and it has continued to grow throughout the ages. This interest did not develop into a distinct science of nutrition, however, until the twentieth century.

E. V McCollum[1] has aptly summarized man's concern for food in the first of a series of articles on nutrition in *Today's Health.*

"Mankind has been on this earth for not less than 300,000 years For a large share of that time man has been a hunter and food-gatherer, eating what he could find. Around 6,000 years ago, when the earliest civilizations were being established in a few places, man set forth in earnest *as a food-producer to alleviate* his ever-pressing need to satisfy hunger. Yet for less than 50 years has man possessed the knowledge that would permit him to provide and then select combinations of foods to nourish his body as it rightfully and properly should be nourished."

Egypt. On an old millstone found in [illegible]

written as a hymn of praise to the God Ptah, extolling him as the supreme Sun God The manuscript reveals the existence of a government that apparently was vitally interested in food, for it reads

"And thus the stations [official positions] were made and the functions [of government] were assigned, which furnished all nutrition and all food . . . Everything has come forth from him, whether food, or nutrition, or food of the gods, or any good thing."[2]

Babylonia. The interest of the ancients in food and in dietary matters is shown, it will be remembered, by the biblical story of Daniel and his three companions who were chosen to stand before King Nebuchadnezzar of Babylon as "youths in whom there was no blemish . . . and understanding science" They were to receive daily a portion of the king's dainties and his wine. But Daniel objected to this regimen, much to the consternation of the chief eunuch, who feared the king's displeasure if these young men's countenances should be "worse-looking than those of other youths." Daniel then instituted what was probably the first dietary experiment when he persuaded the chief eunuch to allow him and his companions to be given, for a period of ten days, a diet of pulse (legumes, such as peas, beans and lentils) in place of the king's meat, and water in place of his wine. *It will be remembered that at the end* of the ten days, they looked so well that they were allowed to continue in their own way, and at the end of their three years' training, the king found them "ten times better than all the magicians

[1] McCollum, E V· Today's Health, October, 1957.

[2] Breasted, J. H. The Dawn of Conscience, New York, Scribner, 1933.

and enchanters that were in all his realm." Thus we see a beginning, at about 600 B.C., of an appreciation of things "scientific," even though a very meager fund of knowledge existed. Confidence in magic was beginning to wane.

Greece. Primitive man soon learned to associate his diseases with his food supply. Even the medicine man of the time was primarily interested in the [illegible]

until Hippocrates arrived on the scene of action about 460 B.C. He linked the development of medicine to that of nutrition and recognized that all foods [illegible]

[illegible]

tiated Galen (A.D. 130 to 200), after finishing the medical course of his time, went from Greece to Alexandria in Egypt, where he was allowed to dissect the bodies of executed criminals. Later he experimented upon hogs and, as a result of his experiments, concluded that the stomach was a place in which food could be resolved into particles sufficiently small to be absorbed.

Experimental research as a necessary factor in the study of medicine was given a great impetus by Galen. However, for more than a thousand years after his death little progress was made. During the 16th century Leonardo da V[illegible]

[illegible]

lism, or what becomes of the food after it is digested in the body. Lavoisier was followed in the 19th century by such illustrious men as Liebig, Voit and Rubner.

While new concepts of nutrition were developing in Germany and several other European countries, in France Pasteur was astonishing scientific circles with his discoveries in the field of bacteriology, hygiene and the value of antiseptics, introducing a new era in public health. Even earlier, Florence Nightingale had recognized that good nursing demanded hygienic conditions and adequate food and thus revolutionized the care of wounded soldiers in the Crimea.

The 20th century brought wide interest in all phases of health and prevention of disease. In the United States the names of Lusk, Chittenden, Mendel, McCollum, Murlin, Benedict, Sherman and Mary Swartz Rose stand out as pioneers in their respective fields of nutrition research.

Evolution in Nutrition Research

Early in the 20th century research workers in food chemistry and in physiology in Europe and in America demonstrated the need of good-quality protein for the growth of animals. Later the concept of the number and the type of minerals needed for growth came to include trace elements, as well as those present in larger amounts. At the same time other workers had shown the presence and the need for certain "accessory food factors," later called vitamins. Then followed in rapid succession studies of amino acids, essential fatty acids, hormones, enzymes, chemical regulators and intermediary products of digestion and metabolism.

Research methods and scientific tools have kept pace with changing concepts. First, the chemist analyzed foods for protein, fat, total ash and moisture, and assumed the balance to be carbohydrate in nature. Then he analyzed the ash for its specific mineral constituents. Later, animal-feeding experiments supplemented the chemist's data by showing

that hitherto unrecognized food factors were necessary for growth and that the rate of growth could be used to measure the presence of such substances. This method is known as bioassay. Now micro-organisms are being used, and the method is called microbiologic assay.

New methods were developed for studying the processes of metabolism and its end products At first animals were used for such studies As differences in species became evident, it was obvious that research on human subjects would be the only way to understand human metabolism Thus the present trend is the study of nutritional status of human subjects under carefully controlled conditions

Groups of laboratories in various parts of the United States are working together on co-operative projects too extensive for any one laboratory to undertake. The Institute of Home Economics, Agricultural Research Service, and the Office of Experiment Stations are giving Federal support to nutrition studies, which should yield basic information of benefit to us all.

NUTRITION, A NATIONAL AND AN INTERNATIONAL ISSUE

The science of nutrition took on new significance during and after World War II. To be sure, the League of Nations had attempted to set up standards for adequate nutrition as far back as 1935, and these recommendations had been recognized by many countries; [illegible]

United States and to application of the available knowledge in order to keep people as well as possible during the extreme strain of the war years The National Nutrition Conference in 1941 launched a nation-wide program, with nutrition committees set up in nearly every state doing an active job of promoting better nutrition. At about the same time the National Research Council established the Food and Nutrition Board to study the broad problems of nutrition on a national and international scale. One of their first accomplishments was to establish Recommended Dietary Allowances for various age and sex categories. This yardstick of good nutrition published first in 1941 with five subsequent revisions has done much to give nutrition education in this country a common goal (*See* Chap. 10.)

The concept of what better nutrition can mean to a nation was not new, but there is a new emphasis with the realization that international planning needs to be done to ensure even a degree of good nutrition for all people.

The importance of food in making peace terms work is emphasized by the fact that one of the first international organizations was set up to help consumers and food producers plan for a better-fed world The United Nations Food and Agriculture Organization (FAO) grew out of the meeting held at Hot Springs, Va, in May, 1943, and was launched as a full-fledged international organization in Quebec, Canada, in October, 1945, under the leadership of Lord John Boyd Orr, a world leader in the field of nutrition. He was the 1949 recipient of the Nobel Peace Prize in recognition of his leadership in this work. The FAO is concerned not so much with the theories and the terms of peace as with the establishment of conditions that will help to make peace.

Two thirds of the world's people never have had enough to eat or the right kind of food to promote health In [illegible]

food do not get enough of it or the right kind. Today, science is trying to provide information on how to produce enough

food to feed the world, and the FAO is a first step toward putting that in-

nutrition is mentioned and emphasized repeatedly in the FAO articles of organization The science of nutrition ties in on the one hand with the agriculture of nations and on the other with the health of nations The World Health Organization (WHO) is another United Nations subdivision concerned specifically with the health of the world's people Still another UN subdivision—the United

at least an elementary education, including some simple rules of health. UNESCO has selected *Food and People* as a major topic for study and for a series of publications under that title These well-written and illustrated pamphlets provide vivid glimpses into the world's food problems and its resources for feeding an increasing population Of first concern is the quantity of food to provide sufficient calories. A world map (Fig. 1) from *UN Sets the Table*[3] shows several densely populated countries where calories provided were less than 2,250 per person in 1939, whereas the United States and others of the more prosperous countries had more than 2,750 calories per capita.

A joint Nutrition Advisory Committee of experts from several countries is working to co-ordinate the activities of FAO, WHO and UNESCO where they

ment to wipe out mass hunger and lift the burdens of hopeless poverty from men's shoulders by applying modern scientific knowledge to the development of the earth's resources. It is a far more fundamental solution to the world's ills than the military and the political preoccupation that seems to absorb the attention of most governments [4]

PREVALENCE OF NUTRITIONAL DEFICIENCIES

United Nations agencies and others study continuously the areas of the world where nutritional deficiencies still exist. Some of the deficiency diseases discussed in Chapter 20 are seldom found in the United States today, but all of them and more are found in the world today Every student of nutrition who is also a good citizen should be conscious of world health problems Beriberi, scurvy, pellagra and rickets

known conditions, such as kwashiorkor among children in many parts of the world, have been recognized more recently as deficiency diseases.

In order to study the extent of a nutrition problem in a given area or country, a team of workers consisting of medical men and nutritionists may make a survey. Large samples of population groups are given physical examinations to discover their nutritional status Nutritionists may study the food pattern of the people and the nutrients available and attempt to correlate their findings with the medical picture. Recommendations for improvement of the situation must take into account local resources, nutritive value of native foods and ways in which they are used. Finally, consideration is given to what help may be needed from outside.

The United States still has mild nu-

[3] Kihss, Peter. UN Sets the Table, Food and People series, UNESCO, 1950

[4] Director-General's Report. World War Against Want, the Work of FAO, 1950-1951.

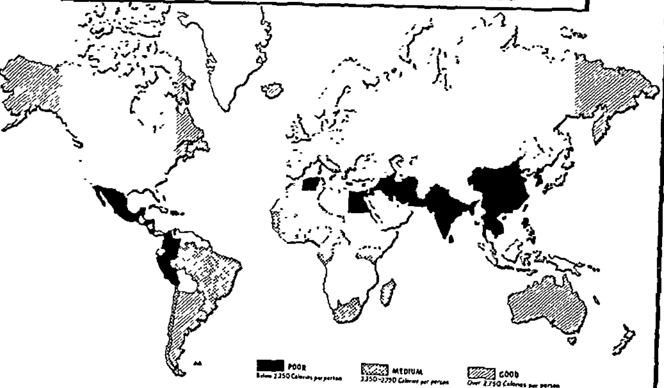


Fig 1. Kihss, Peter *U.N Sets the Table*, Food and People Series, No. 2, a UNESCO project, New York, Manhattan Publishing Co., 1950.

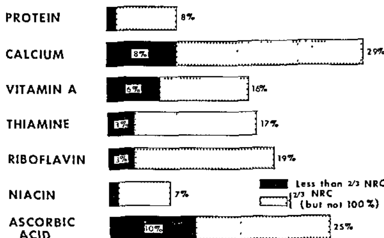


Fig. 2 (U. S. Department of Agriculture)

tritional deficiencies, especially among people of low income and limited education. Often these deficiencies are termed subclinical because they are not the frank deficiency diseases found in underdeveloped countries Vague or [illegible]

States today because we have the knowledge and the resources to discover the cause and suggest a remedy

Repeated surveys have been made of population groups in the United States in an attempt to evaluate their food habits and their nutritional status. One such survey made during World War II[5] showed that large numbers of people were not eating foods to provide the nutrients recommended for optimum health A later survey made in 1955 and reported by Faith Clark in 1957[6] shows that nutrient intake seems to have improved in general, but there are some families who, though not suffering from obvious malnutrition, fail to get recommended amounts of certain nutrients Calcium and ascorbic acid are the two nutrients which most often failed to meet recommended allowances in the family diets investigated (Fig 2)

Nutritional status must be measured by health and by medical examination of individuals Dietary surveys may show diets to be faulty or even seriously inadequate according to our standards, but evidence of serious malnutrition may not be conspicuous However, poor diets predispose a proportion of such groups

[5] National Research C[illegible]

[6] Clark, Faith Family Diets Today, Nutrition Education Conference Report, April 1, 1957.

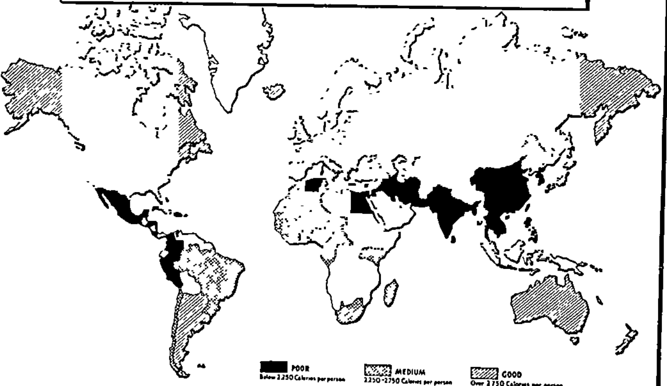


Fig. 1 Kihss, Peter: *U N. Sets the Table*, Food and People Series, No. 2, a UNESCO project, New York, Manhattan Publishing Co., 1950.

1948, there was a striking improvement in health, particularly in those symptoms which might have been expected to respond to the nutritional factors provided in the enrichment program Beriberi, which had been widespread in years prior to 1943, was practically nonexistent in 1948, and tuberculosis deaths have been cut in half in 8 years[8] The policy of flour enrichment in Newfoundland has been maintained since her union with Canada in 1949, and there is enthusiastic support for it as a consequence of the health improvement accomplished

The enrichment of flour and bread in the United States has been in effect since 1941 and is now mandatory in 27 states, Hawaii and Puerto Rico Accomplishment of this program in the United States cannot be measured as it was measured in Newfoundland, but the findings there should help persuade the skeptics that there is merit in the program The principle of enrichment has been applied to corn products and rice in some Southern states.

Rice is the predominant grain of the Orient and the chief cereal food of more than half the world's population Beriberi has long been associated with the eating of polished rice, the form preferred by most of these peoples Few of these countries have adequate statistics to give a true picture of the incidence of beriberi, but the Philippines have kept records since 1920 On the peninsula of Bataan, deaths from beriberi had ranged from 150 to 300 a year, and as many as 12,000 persons gave evidence of health continually impaired by beriberi symptoms Since the initiation of the rice-enrichment program in 1949, inspired and directed by Dr. R R. Williams, the incidence of beriberi has been reduced about 90 per cent, and not a single death from beriberi occurred during the next 2 years[9] While education may have been able to stimulate some improvement in food habits and in methods of milling rice over a long period of time, it is unlikely that any such accomplishment as that reported above ever could have been realized from education alone, even within the lifetime of the children

Other studies on smaller groups of children or adults in this country in institutions where diet could be controlled and nutritional status studied have also shown that food providing essential nutrients not only can cure deficiencies but also make the difference between mediocre and bouyant health.

AMERICAN FOOD HABITS CHANGE

Comment on the history of nutrition in this country would not be complete without mention of the changes in the food-consumption pattern The Department of Agriculture keeps up-to-date records of the types and the amounts of foods available in this country for

[illegible]

difficult to interpret because they are based on total available food and not on actual consumption figures. Nevertheless, they give some idea of trends in available nutrients during this span of nearly half a century (*see* Fig 3). The significant decrease in the use of grain products and potatoes has resulted in a marked reduction in carbohydrates in spite of an increased use of sugars and sweets. The gradual rise in the curve for fat cannot be interpreted as a true picture indicating that much increase in consumption, because there is no way of knowing how much fat is wasted in the butchering of meats, in the preparation of food or on the plate, but the trend of consumption is upward

Authorities tell us that the figures on food supplies during World War II and

[8] Medical Survey and Resurvey in Newfoundland, 1944 and 1948 Canad M A. J. 52 227, 1945, 60 329, 1949

[9] Williams, R. R. Am J. Nursing 52: 447, 1952.

to the possibility of physical ills or defects resulting from habitual malnutrition. Therefore, a distinction should be made between the extent to which diets seem to be inadequate, as shown by dietary surveys, and the prevalence of actual deficiency conditions in a population group

The application of existing knowledge of the significance of optimum nutrition for health is slow, as are all preventive or prophylactic measures in public health The benefits lack drama and can be measured with difficulty only after years of work Premature and exaggerated claims too often are made for the benefits to be derived from optimum versus merely adequate nutrition Individual variation as to need for specific nutrients must take into consideration such factors as age, environment, occupation and stress conditions About all that can be said is that the evidence now available, leads to but one conclusion: it is that there is a real difference, as measured in terms of growth, development and general-health, between optimum and just adequate nutrition, and that every practical effort should be made to help more people attain the optimum

NUTRITIONAL IMPROVEMENT YIELDS RESULTS

Food and nutrition experts have been teaching for decades the value of good food, but it is difficult to evaluate the results of their efforts. The evidence is all around us in the robust health of most children today But statistical or scientific evidence of accomplishment is necessary if governments are to initiate and support such programs.

The relation between the customary diet and the nutritional status must be

The incidence of signs and symptoms of nutritional failure, work efficiency and growth patterns of infants and children are valuable criteria for judging the effectiveness of a program. Such studies have been made on isolated population groups, and these afford good evidence that improvement of the diet can benefit nutritional status.

In Great Britain[7] during World War II it was demonstrated that "improvement of the diet of workmen whose diet was not previously up to the standard for health was followed by increased output without any conscious increased effort and also by a reduction in the number of accidents." In the United States the importance attached to proper feeding of industrial workers has come to be appreciated to the extent that provision of adequate food for employees has continued to be emphasized where there is progressive plant management The feeding of men in the armed forces is constantly under study to improve both palatability and nutritive quality of the food because authorities appreciate the importance of the right food for health, morale and general stamina of the men.

Among the postwar studies, those in Newfoundland and in the Philippines are notable examples of measured ac-

the authors made a survey in several of the northern outposts 15 years prior to the study begun in 1944 in some of the southern outposts The conditions were strikingly similar. The signs and the symptoms found on clinical examination and biologic tests in 1944 were indicative of a multiple vitamin deficiency. The enrichment of margarine with vitamins A and D and of all-white flour with three B vitamins plus iron and calcium became effective in June, 1944 When the second survey was made in

[7] Orr, John Boyd. Brit. M J 1 73, 1941.

1948, there was a striking improvement in health, particularly in those symptoms which might have been expected to respond to the nutritional factors provided in the enrichment program Beriberi, which had been widespread in years prior to 1943, was practically nonexistent in 1948, and tuberculosis deaths have been cut in half in 8 years.[8] The policy of flour enrichment in Newfoundland has been maintained since her union with Canada in 1949, and there is enthusiastic support for it as a consequence of the health improvement accomplished.

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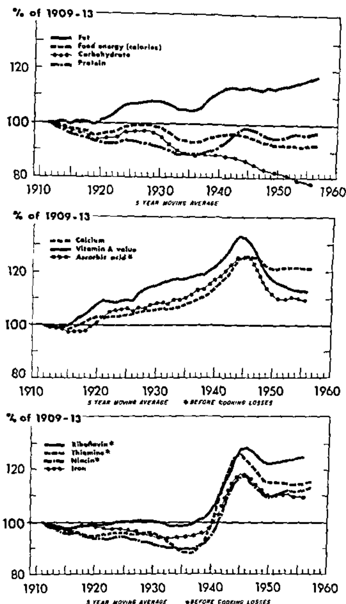


Fig 3 Per capita civilian consumption, U.S.A. (*Top*) Food energy, protein, fat and carbohydrate (*Center*) Calcium, vitamin A and ascorbic acid (*Bottom*) B vitamins and iron. (Agricultural Handbook No. 62 and Supplement for 1956, U. S Department of Agriculture, Washington, D. C., 1957)

immediately afterward may give a wrong impression because certain commodities were stockpiled at that time and were not really available for civilian use However, the available supply of meat, fish, poultry, eggs and dairy products has been fairly constant over most of the period studied This means that there was an adequate supply of good-quality protein if it had been evenly distributed

It is interesting to speculate upon what factors—economic, educational or other—influence American food habits When the national nutrition program was launched in 1941, followed immediately by bread and flour enrichment, the supply of available nutrients showed a marked increase. Obviously the nutrients added to flour and bread—thiamine, riboflavin, niacin and iron—showed the most abrupt rise at that time and have continued at a level well above prewar The increased use of citrus fruits and green and yellow vegetables during the 1940's is reflected in the increase in vitamins A and C during those years, but the trend in the use of these foods and the vitamins they supply has been decreasing during the last 10 years

One cannot help but wonder whether or not the intensive educational campaign and the popular interest in nutrition during the war years was responsible for the increased use of protective foods Is the decreased use of *some* of the protective foods today an indication of ignorance or lack of interest in nutrition? To be sure, the nutrient supply is still liberal, but the downward trend of these curves does not leave us with a feeling of complacency We know that foods are not evenly distributed, much is wasted, and some people cannot afford to buy as many of the protective foods as they need. It is apparent, therefore, that nutrition education should continue to be a vital force in this country

POPULAR GUIDES FOR TEACHING NUTRITION

For many years nutritionists have offered homemakers easy guides for meal planning Such guides or dietary patterns differ slightly in their wording but give essentially the same advice.

A Daily Food Plan

Milk Group (Some Milk Daily)

Children	3 to 4 cups
Teenagers	4 or more cups
Adults	2 or more cups

Pregnant and nursing mothers 4 to 6 cups
Cheese and ice cream may replace part of the milk.

Meat Group (2 or More Servings)

Beef, veal, pork, lamb, poultry, fish, eggs;
dry beans and peas and nuts as alternates

Vegetable-Fruit Group (4 or More Servings, Including)

A dark green or a yellow vegetable,—at least every other day, for vitamin A.
A citrus fruit or other vegetable high in vitamin C—daily
Other fruits and vegetables, including potatoes.

Bread-Cereals Group (4 or More Servings)

Whole grain, enriched, restored.

FOOD FOR FITNESS

A Daily Food Guid



MILK GROUP

Some milk for everyone

Children .	3 to 4 cups
Teen-agers .	4 or more cups
Adults . . .	2 or more cups

MEAT GROUP

2 or more servings

Beef, veal, pork, lamb, poultry, fish, eggs

As alternates—
dry beans, dry peas, nuts

VEGETABLE FRUIT GROUP

4 or more servings

Include—

- A citrus fruit or other fruit or vegetable important for vitamin C
- A dark-green or deep-yellow vegetable for vitamin A — at least *every other day*
- Other vegetables and fruits, including potatoes

BREAD CEREAL GROUP

4 or more servings

Whole *grain, enriched, or restored*

Plus other foods as needed to complete meals and to *provide additional* food energy and other food values

Fig. 4A. (Leaflet 424, Institute of Home Economics, U. S. Department of Agri
Washington, D.C.)

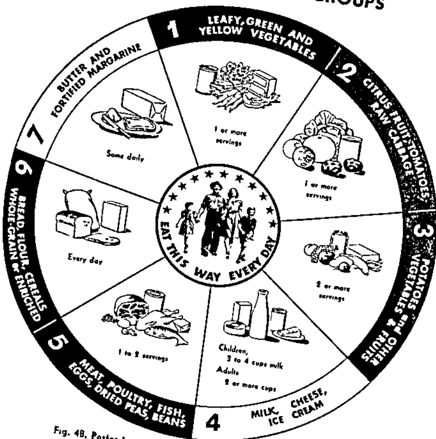


Fig. 4B. Poster issued by Institute of Home Economics, U. S. Department of Agriculture, Washington.

A basic scheme for meal planning[10] using 4 food groups has been suggested by the Institute of Home Economics. Most foods contain more than 1 nutrient, but no single food furnishes all the necessary nutrients in proper proportions to maintain health It is not difficult to obtain the factors needed if the types of foods listed below are eaten daily in the amounts suggested

The minimum number of servings listed above form a foundation for a good diet. To round out meals and to satisfy the appetite, many people will use more of these foods, and everyone will use foods not specified such as butter, margarine, other fats, sugars, sweets, baked goods, etc A pattern dietary based on these 4 groups is given in detail in Chapter 18.

[10] Page, L., and Phipard, E F · Essentials of an Adequate Diet, Home Economics Research Report No 3, Nov, 1957.

Each of the broad food groups listed in the daily food plan has a special job to do, no single group provides all the nutrients, but together they furnish a major share of the protein, the minerals and the vitamins recommended. These needs, and how they are met, will be discussed in more detail in the chapters which follow

An earlier scheme, commonly referred to as the Basic 7 Foods Groups (*see*

food groups better than 7. Any of these schemes for teaching nutrition allow for considerable variation to meet differences in taste preferences, national food patterns and cost The choice of teaching devices should be adjusted to needs and revised in line with the dietary patterns of national or regional groups Kodachrome slides, films, posters and other educational materials produced by other agencies usually conform to one of the government plans and are useful for popular education The commercial materials are often more colorful than those produced by educational and government agencies, but they must be used with discretion if they are accompanied by advertising

Canada's Food Rules are very similar to ours, and they have also produced some good educational films

COMMUNITY NUTRITION PROGRAMS

Community health programs always

as a knowledge of how to prevent the spread of infections, that public-health measures in a community should include attention to the kind of food served in schools, factories, institutions and restaurants, as well as attention to *inspection of the water and the milk* supply and the hygiene of food establishments. Education and opportunity for good nutrition are becoming a major part of every community-health program, because it is now generally recognized that optimal health is not possible without the right food and that suboptimal health is frequently responsible for indigence, delinquency, discomfort, inefficiency and potential disease.

To attack new problems in the field of public health is never simple, and the problem of malnutrition is especially complex, because it has medical, social, economic and psychologic aspects In any community it requires the co-operation of all public and private agencies with a broad vision on the part of administrators, staff and especially family case workers as to the part that better food can play in improving the health of *their clients Many times they are so* concerned with family relations and budget problems that there is little time or inclination to investigate the food used by the family.

Role of Nursing Services

In recent years a number of health

and departments of education, may maintain nursing services Many communities also have a visiting-nurse service *under private auspices The function* of a public-health nursing service may be entirely educational, or it may be a combination of health education and bedside care Checking the food habits of the family or *the individual* may disclose glaring deficiencies that might be corrected within the existing food budget.

The nurse has an opportunity to carry practical nutrition into many homes untouched by other services. She must be

prepared to give necessary instruction in regard to food selection She will handle few cases in which some improvement is not required It is strongly recommended that a well-trained nutritionist be included on the staff of the larger organizations to serve as consultant and to plan a broad nutrition program in which [illegible]

may be obtained through consultant services established by the local nutrition committee or by other community agencies [illegible]

in helping a patient to carry out the doctor's orders concerning special diets and to fit the diet into the family food plan In assisting with such a program for one member of the family, improve- [illegible]

[illegible] instances poor health that cannot be traced to any organic disease can be corrected by helping the patient to secure an adequate, normal diet

To change ingrained food habits is usually a slow process, and improvements may have to be made gradually [illegible]

in itself makes such a significant contribution to an otherwise poor diet [illegible]

[illegible] adequate nutrition for all members at low cost. Instruction may be needed in the preparation of food, and these suggestions should be made in line with the facilities available for cooking (See Part Three)

In certain circumstances the nurse may have a unique opportunity to promote better nutrition She may be expected to make practical suggestions for securing the kind and the amount of food necessary during pregnancy and lactation (see Chap 12) She may be called upon to help prepare the baby's formula and, later, to advise on the introduction of foods other than milk (*see* Chap 13). Preschool and older children may need guidance in food habits, or the mother may have to be helped as to what foods to buy, how to prepare them and how to induce the children to eat the right food When the children reach high-school age and begin to eat one meal away from home, good food habits established early count, but even then these children may need guidance on how to choose the best lunch for the limited amount that they have to spend (*see* Chap 14).

Adults and older people often fail to realize that their health also may depend upon the habitual consumption of an adequate diet and that good food habits can delay the [illegible]

can be of great assistance in suggesting foods that will hasten recovery and help the patient to adjust to a normal diet again

STUDY QUESTIONS

1 About when did the modern concept of nutrition as a science take shape?

2 What contribution has the United States made to the setting of standards for nutritional needs?

3 Which of the U.N. organizations are concerned with the food and the nutrition of populations?

4 What evidence is there of nutritional deficiencies in the United States?

5. Have there been some improve-

ments in the American dietary in recent years? State the probable reasons for the changes that have occurred.

6 Numerous popular guides have been published to help laymen select better food Which of these guides with which you are familiar have you found to be most helpful to you? Why?

7. Give scientific evidence that improvement of nutritional status is possible as a result of food enrichment.

8. Health departments have long been responsible for the prevention of communicable diseases How will the addition of education in nutrition alter the programs of health agencies?

See Bibliography in Part Four for other pertinent material on the topics discussed in this chapter.

World Use of Carbohydrate Foods
Sugars or Soluble Carbohydrates
Insoluble Carbohydrates
Metabolism of Carbohydrates
Bread, Flour and Cereal Enrichment

CHAPTER TWO

Carbohydrates

WORLD USE OF CARBOHYDRATE FOODS

"Bread, the staff of life" might be paraphrased as "carbohydrate, the fuel of life." Carbohydrate foods are the major sources of calories for all peoples the world over They make up from 50 to 60 per cent of the American diet and a higher percentage for peoples in many other countries They are the cheapest and most easily digested form of fuel for human and animal energy

The natural sources and the form in which the common carbohydrate foods are used around the world throw light on the respective standards of living in various countries A world food survey made by the FAO charts the foods used in 70 countries Eastern Asia and eastern Europe derive over 80 per cent of their total calories from carbohydrate foods, grain and potatoes. In Asia the predominating grain is rice, in Europe, wheat with some rye in central Europe and oats in Scotland Potatoes are an important carbohydrate food in many countries, especially in Poland, Scandinavia and Russia The Western world eats wheat in one form or another—bread, breakfast cereals, macaroni and spaghetti, with oats, corn and other cereals in lesser amounts The American Indian and peoples of Central and South America make corn their "staff of life" In general, the peoples of the Western Hemisphere eat fewer cereal products than those of eastern Europe and Asia

The word *cereal* is derived from Ceres, the mythologic goddess of grain and harvest, pictured by the Greeks as giving the first grain to man. Today, grains furnish about one half the food calories for the world's people and a large proportion of the feed for farm animals

The United States and Canada, along with certain western European countries and Australia and New Zealand, are the big consumers of sugar in the form of candies, cakes, sugar and other sweets.

A food nutrient which assumes such importance in the maintenance of life on this planet demands further study Carbohydrates are the chief form in which plants store potential energy. [illegible]

[illegible]

has yet to understand and duplicate the chemical laboratory of the green leaf. The largest proportion of the sun's energy which is transformed into potential energy by plants appears in some form of carbohydrate, made up of the 3 elements carbon, hydrogen and oxygen.

SUGARS OR SOLUBLE CARBOHYDRATES

The single sugars (monosaccharides) are the simplest and smallest carbohydrate molecule They require no digestion and are readily absorbed from the intestine directly into the blood stream Three single sugars are found in foods and are formed from other carbohydrates in the process of digestion: glucose, fructose and galactose.

GLUCOSE, also called dextrose, is abundant in fruits and vegetables It is the form of carbohydrate to which all other forms are converted eventually for transport in the blood and for utilization by the tissues of the body

FRUCTOSE, also called levulose and fruit sugar, is found associated with glucose in many fruits and vegetables, and especially in honey It is responsible for the peculiar sweetness of honey

GALACTOSE is not found free in nature but is derived from the double sugar lactose by digestion or hydrolysis It is manufactured for experimental and therapeutic purposes Sometimes it is used diagnostically by the medical profession to test the functioning of the liver

The double sugars (disaccharides) commonly encountered in foods are sucrose (cane or beet sugar), maltose (malt sugar) and lactose (milk sugar). The double sugars may be split by acid hydrolysis outside of the body or by specific enzymes in the digestive tract into single sugars Each of the 3 double sugars has distinct characteristics of interest in human nutrition

SUCROSE, ordinary granulated, powdered or brown sugar, is one of the sweetest forms of sugar and costs the least. Consequently, it is consumed in greater quantities than all others, often to the detriment of the teeth and of [illegible]

tary tract and because sucrose tends to satisfy the appetite and thus reduce the consumption of other more necessary foods In fact, sugar is one of the best examples of "empty calories," meaning calories unaccompanied by other nutrients Molasses, a by-product of sugar manufacture, and "raw sugar," the first crystallization, are crude forms of sucrose retaining some minerals and vitamins from the original sources. Blackstrap molasses is the darkest form and carries the most impurities along with some minerals and vitamins, but the flavor is disagreeable to many people and it has no special virtue.

MALTOSE, or malt sugar, does not occur free in nature but is manufactured from starch by the action of diastase, a plant enzyme obtained from sprouting grains Maltose is also an intermediate product in the digestion of starch and is easily utilized by the body. Often it is used in combination with dextrin in infant and invalid diets where it is desirable to have a soluble form of carbohydrate which does not readily ferment in the digestive tract

LACTOSE, or milk sugar, is the only one of the common sugars not found in plants. It is formed only in the mammary glands of lactating mothers, animal or human It is less soluble and more slowly digested than the other 2 double sugars When consumed in amounts greater than those ordinarily present in milk, some of it may not be digested. An undigested residue of lactose in the large intestine has a laxative action which may be desirable in certain instances but in excess causes diarrhea Lactose is an excellent medium for the growth of certain useful acid-tolerant types of bacteria and has been used therapeutically to increase this type of

bacterial flora in the large intestines Lactose also seems to increase the absorption or utilization of calcium, and often this finding is cited as the reason for the efficient utilization of calcium from milk. Sometimes lactose is given as an accompaniment of calcium salts prescribed for persons who have an allergy to milk and must obtain their calcium in another form.

INSOLUBLE CARBOHYDRATES

For more stable and efficient storage of potential energy the plant world packs its fuel in larger units than the sugars, namely, starch, dextrin and cellulose. All of these are *polysaccharides*, the molecules of which may be

growing plants, one essential characteristic of a storage material is insolubility. To be suitable for a human food, however, a carbohydrate must be subject to digestion by the enzymes of the digestive tract Starches and dextrins fall into this category, but celluloses and hemicelluloses which occur in foods are more

their resistance to decay. Thus, nature synthesizes all types of carbohydrate, from the very soluble, easily fermented sugar, to wood cellulose as resistant as the cedars of Lebanon or the redwoods of California.

Starch

The starches, found in grains, vegetables and other plant products, are not only the major form of fuel storage in plants but one of the most useful forms of fuel foods for humans and animals. The percentage of starch in a vegetable such as the potato is lower than in the grains because of its higher moisture content From the table on page 22 of starchy foods and sweets, many of

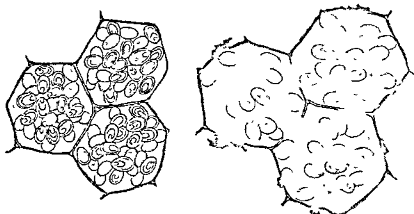


Fig. 5 Potato cells, showing starch grains as they appear raw and after cooking Note the softened appearance and rupture of both cell walls and starch granules. (Broadhurst, Jean. Bacteria in Relation to Man, Philadelphia, Lippincott)

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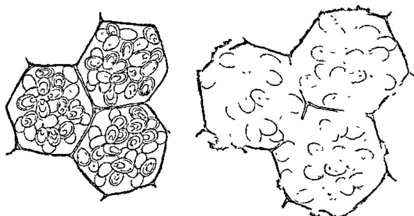


Fig 5 Potato cells, showing starch grains as they appear raw and after cooking Note the softened appearance and rupture of both cell walls and starch granules. (Broadhurst, Jean: Bacteria in Relation to Man, Philadelphia, Lippincott)

CARBOHYDRATES IN COMMON STARCHY FOODS AND SWEETS

STARCHY FOODS	PER CENT
Barley, pearled	79
Breads, all types	52–58
Corn meal and grits	74–78
Crackers	71–74
Macaroni, spaghetti and noodles	73–77
Oatmeal or oat cereals	70
Potatoes, raw	19
Rice or rice cereals	79
Rye flour	68–78
Wheat flour	69–79
Wheat cereals	72–80

SWEETS	PER CENT
Cakes	56–62
Candies	56–99
Cookies	60–80
Dried fruits	75–88
Honey	80
Jams and jellies	65–71
Syrups	74
Cane or beet sugar	100

which appear daily in our meals, it is easy to estimate how much carbohydrate they contribute to our diet The starch of the grain is mostly in the endosperm encased in a protective covering of cellulose, the bran or husk, which is more or less resistant to digestion The starch granule consists of tiny particles of starch usually arranged in concentric layers or a pattern of characteristic shape and appearance. Thus, each kind of starch—potato, wheat, arrowroot, corn—can be identified by microscopic examination. A more detailed discussion of grains and cereal products is given in Chapters 38 and 39.

Effect of Cooking and Digestion. Before starch can be used readily by the body the outer membrane must be

the outer cellulose envelope is ruptured, and the moisture permeates the starch granules themselves. The starch granules have an affinity for water, absorbing it as a sponge, slowly at room temperature, rapidly at boiling temperature Thus, a spoonful of dry cornstarch or flour dropped into cold water may be stirred to a smooth paste, but when dropped into boiling water it forms a lump because the outer grains swell so rapidly that they form a jacket around the others After rupture of the cellulose wall by cooking, the starch is in a form that can be acted upon more easily by digestive enzymes (Fig. 5). There is some experimental evidence that the body can digest raw starch to a limited extent, probably after bacterial disintegration of the cellulose covering The relative digestibility of starches from different sources has been the subject of some debate. Arrowroot, tapioca and sago may be digested more rapidly than starch from corn, wheat or rice, but the ultimate completeness of digestion probably does not vary greatly. The length of cooking time may also affect the rate more than the completeness of digestion

After the rupture of the cellulose walls by cooking, starch may be acted upon by the ptyalin of the saliva In salivary digestion starch passes through

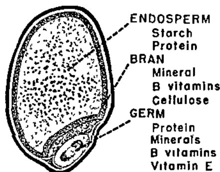


Fig 6 A grain of wheat has three parts. All are used in whole-wheat flour but only the endosperm in white flour. Note what a small part of the grain is germ (Wellman Food Plannings, Lippincott)

THE STORY OF FIBER IN THE BODY

IN FOOD	IN THE DIGESTIVE TRACT	IN EXCRETA
Cellulose in vegetables, fruits, cereals, nuts	Functions chiefly as bulk Softened by digestive juices Stimulates peristalsis Small fraction digested by bacterial action and absorbed as glucose Largest proportion undigested passes into large intestine	Indigestible residue in stools

several stages it is first transformed into soluble starch, then into a series of three or more intermediate products known as dextrins, and later into the sugar, maltose, an entirely soluble product Accompanying each dextrin stage a small quantity of maltose is formed, the

plain cracker or bread becomes sweet to the taste if chewed long enough, that is, if it is retained in the mouth a sufficient length of time to permit digestion to proceed to the maltose stage

Cooking alone may carry the breakdown of starch to the dextrin stage, if continued long enough Starch granules break down most rapidly when moisture is present Long application of dry heat, such as in baking or toasting, will also change starch to soluble dextrins The palatable flavor of the brown crust of rolls or bread or the brown part of toast or of toasted cereals is due partly to forms of dextrin Sometimes dextrins are found free in nature, especially in cereals, but they occur more frequently as intermediate products in the change of starch to maltose as described above. Dextrins also occur as intermediate products in digestion of starch by malt enzymes used in making malt beverages and in certain other commercial processes such as the making of mucilages The Government uses dextrin, made from cassava starch, for the mucilage on postage stamps

Glycogen

A small amount of carbohydrate is stored in the liver and the muscles in the form of glycogen The amount is so small that it is only a temporary source of fuel in the body between meals and is mostly used up in 24 hours if no food is eaten Liver and deep-sea scallops contain the most of any familiar foods, ranging from 2 to 6 per cent Factors controlling glycogen formation and breakdown in the body are of interest to the diabetic specialist because this mechanism helps to control the level of the glucose in the blood

Cellulose and Hemicellulose

Cellulose and hemicellulose are the framework of plants They are the chief constituents of wood, of stalks and leaves of all plants and of the outer coverings of seeds and cereals Fiber forms the more or less porous walls of cells in which water, starch, minerals and other substances are stored in the plant much as honey is held in the comb.

the more tender celluloses from green leaves and young shoots No known enzyme secreted in the human intestine can digest cellulose, but bacterial fermentation or disintegration may play a role in dissolving the substances which bind together the cellulose fibers or particles The degree of digestibility varies according to stage of growth, the

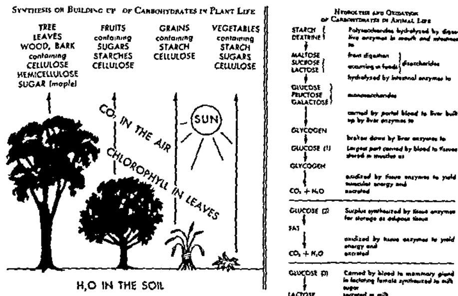


Fig. 7. Synthesis and breakdown of carbohydrates in plant and animal life.

type of plant and the amount of cooking. The cellulose of tender shoots may disappear completely from the intestinal tract.

The indigestibility of cellulose is its major asset, since the undigested fiber furnishes the bulk often necessary for efficient and normal peristaltic action (muscular contraction) of the intestines The addition of cellulose to the diet in the form of bran is suggested sometimes in cases of chronic constipation due to

normal colon performs better when a reasonable amount of bulk or residue is present. Figures were derived from these studies as to the amount of cellulose, or indigestible fiber, that a normal person requires each day. Thus, ¼ oz (6 Gm) has been suggested as an adequate daily allowance, to be increased or reduced according to individual requirements

Vegetables and fresh fruits
1 Gm of fiber/100 Gm. (average serving)
Dried fruits
1 5 Gm of fiber/30 Gm (average serving)
Whole-grain bread and cereals.
0 5 Gm of fiber/30 Gm. (average serving)
Nuts
0 5 Gm of fiber/30 Gm

(For more nearly accurate figures on fiber content of common foods, *see* Table 1, Part Four.)

[1] Stern, F · Applied Dietetics, Baltimore, Williams & Wilkins, 1949.

Agar-agar and pectin are hemicelluloses, closely related to cellulose but slightly different in chemical structure They have the ability to absorb many

of a soft stool. Alginates, the active compounds extracted from seaweeds, are now used extensively in ice-cream manufacture to give body and smooth consistency

The pectins in certain fruits and fruit seeds are responsible for their jelling properties. Chemically, these pectins are complex compounds of several single sugar molecules. Commercial pectin, prepared from fruit seeds, is widely used for making jelly in the home as well as commercially The colloidal property—the ability to form a jell—is increased in the presence of sugars

The therapeutic value of pectin and pectin products in the treatment of diarrhea has been attributed to its capacity for absorbing toxins or neutralizing harmful substances produced by certain bacteria Thus, pectin tends to remove irritants and provide the bulk which promotes normal physiologic peristalsis.

Interrelationships among the different forms of carbohydrate are apparent from the foregoing discussion. A summary of the synthesis in plant life and the breakdown in the animal world is given in Figure 7

Even within the plant there is transition from one form to another In the maple tree the sugar of the sap is changed into the complex molecule, the polysaccharide, wood fiber, an indigestible form of carbohydrate. In such fruits as the banana the carbohydrate is in the form of starch while the fruit is maturing, but some of it is changed to sugar as the fruit ripens In some vegetables, sugar synthesized by the leaves is stored as starch, as in mature beans, peas and corn People like green corn and green peas because the carbohydrate is still partly sugar Connoisseurs of fresh garden vegetables are aware of how quickly the sugar of corn and green peas disappears after harvesting, and how much more delicious they can be when used immediately after picking This change is due to the enzymes that are present, and the change is stopped as soon as the enzymes are destroyed by cooking

METABOLISM OF CARBOHYDRATES

The varied forms of carbohydrate that occur in foods must all be reduced to one form, glucose, before they can be utilized by the body That is the purpose of digestion and the changes that take place in the liver Even the two single sugars, fructose and galactose, must be changed to glycogen and later to glucose before they can be transported in the blood to the tissues. The glycogen of the liver is broken down

of blood glucose rises slightly after meals in normal persons but is maintained at a relatively constant level, from 70 to 100 mg per 100 cc of blood.

The circulating blood glucose is absorbed by the muscles and other tissue cells to maintain their normal reserve, mostly in the form of glycogen synthesized by the cellular enzymes The muscle glycogen is the reserve fuel for muscular energy and forms a complex glycogen-phosphorus compound that can break down with almost explosive speed when the nerve impulse demands muscular action Much research has been undertaken in an attempt to discover the exact nature of this chemical reaction, which creates motion in a manner utterly unlike anything that

occurs outside of the body. Three vitamins of the B complex group are involved in the oxidation-reduction reactions of carbohydrates in muscle tissue Muscular work is often compared with a mechanical engine, but all such comparisons fail to emphasize the fact that heat is a mere by-product of this reaction in the body rather than a means of producing it, as in an engine To be sure, the heat that is produced is used to maintain body temperature

When more carbohydrate than the body needs for daily work is eaten, the extra is stored for future use. Glycogen in the liver and in the muscles is the temporary storage to carry from meal to meal and overnight The real surplus carbohydrate is transformed into fat and stored as adipose tissue An overliberal supply of carbohydrate in the diet continually is the chief cause of obesity.

Some carbohydrate is essential for the normal metabolism of other foodstuffs. Fatty acids do not oxidize as readily as do sugars in the body. When the body is called upon to burn fat in the absence of carbohydrate, a condition known as acidosis is apt to occur, because the products of the incomplete oxidation of fatty acids are acid in reaction and are toxic to the body. The glucose in the blood stream is used for still another purpose in the lactating mother. When the mammary glands are active, lactose is synthesized from blood glucose by enzyme action in these glands. Thus, the carbohydrate cycle in nature starts with synthesis in the plants to become the fuel for animal life where by oxidation

*Enrichment Levels As Established by Law in Certain States and Some Other Countries**

(All figures represent milligrams per pound as purchased, average food values for similar products without enrichment are given in light-face type)

	Thiamine		Riboflavin		Niacin		Iron	
	Min	Max	Min	Max.	Min	Max	Min.	Max
Bread and Other Baked Goods.								
Enriched	1 1	1.8	0 7	1 6	10.0	15 0	8 0	12.5
Unenriched bread	24		48		4 1		2 7	
Flour								
Enriched	2 0	2.5	1.2	1.5	16.0	20.0	13 0	16.5
Unenriched	.28		.21		4 1		3 6	
Farina·								
Enriched	1 66		1.2		6.0		6.0	
Unenriched	25		.28		3 8		4.5	
Macaroni and Noodle Products.								
Enriched	4 0	5.0	1.7	2.2	27.0	34 0	13 0	16 5
Unenriched macaroni	42		.27		9 2		6 8	
Unenriched noodles	91		.50		10 4		9 5	
Corn Meal and Grits								
Enriched	2 0	3 0	1 2	1.8	16 0	24 0	13 0	26 0
Unenriched corn meal	61		21		4 7		5 0	
Unenriched corn grits	59		.18		5 2		4 5	
Rice								
Enriched	2 0				16 0		13 0	
Unenriched	.3		12		7 4		3 6	

* Based on Federal standards of identity or state laws

it returns to simple water and carbon dioxide as shown in Figure 7.

BREAD, FLOUR AND CEREAL ENRICHMENT

Natural grains carry not only the store of carbohydrates already mentioned but also protein and certain minerals and vitamins essential for good nutrition The vitamin B complex factors present in the natural whole grains are usually sufficient in amount to help form the enzymes necessary for the metabolism of the carbohydrate of the grain. The balance of nature is upset when we find

some of the minerals and vitamins are lost or discarded in the millings It is interesting to note that the latter find excellent use as animal feed. Attempts to educate people accustomed to white-flour products to return to the use of whole-grain products has never been successful Consequently, the expedient of enrichment of bread and flour was initiated during World War II, with other cereal products of various types added to the list later The practice is now widespread, not only in the United States but in several other countries where public-health problems warranted such action.

Bread and flour enrichment is of first importance because bread constitutes one of the main sources of calories in the American diet There are laws making bread and flour enrichment mandatory in 27 states as of 1956 Enrichment of corn meal and grits is also mandatory in several southern states where corn is a major item of the diet, and a rice enrichment law recently was passed in South Carolina The enrichment of infant foods, ready-to-eat breakfast foods, macaroni, spaghetti and noodles is also common, and standards for some have been established even though the enrichment is not mandatory Table on page 26 gives the standard minimum and maximum levels for enrichment of products where such have been defined and also, for comparison, the values of the natural milled products without enrichment.

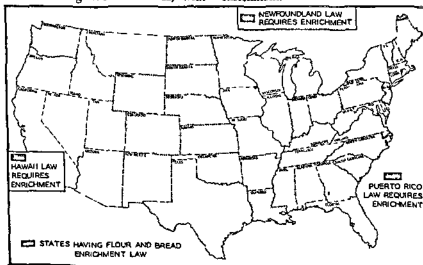


Fig 8. Enrichment legislation map (Food and Nutrition Board, National Research Council)

STUDY QUESTIONS

1. What does the expression "Bread is the staff of life" mean? What other forms of carbohydrate may form the bulk of the diet? In which countries?

2 How did the word *cereal* originate?

3. From what are carbohydrates synthesized by plants? What is the process called?

4 Name the single sugars and give some food sources for each

5. What is the commonest disaccharide? In its usual form does it contribute anything besides calories to the diet? What other double sugars occur in food?

6. Where are starches found in food? Discuss the effect of cooking on starch

7 What is another name for "animal starch"? Where is it found? What is its importance?

8. Some polysaccharides are not digested. Which are they? In which foods do we find them? What is their function?

9 Why will eating more carbohydrate foods than the body needs result in weight gain?

10. What are the end products of the metabolism of carbohydrate?

See Bibliography in Part Four for other pertinent material on the topics discussed in this chapter.

The Place of Fat in the Diet
Food Fats—Definition and Classification
Essential Fatty Acids
Digestion and Absorption
Metabolism and Storage
Other Lipids

CHAPTER THREE

Fat and Other Lipids

THE PLACE OF FAT IN THE DIET

Fats are as important a form of stored energy in animals as carbohydrates are for plants. Statistics for the entire country show an increase in the per capita use of fats during the past half century. Actually, consumption of fat varies so widely among individuals and regions, and so much fat is wasted, that is it impossible to estimate how much really is consumed. McCann and Trulson[1] have discussed the possible significance of the changes in types of fat consumed but conclude that long-range studies of contrasting populations are needed before we can interpret these observations We do know from more detailed studies on men and boys that it is not unusual for them to obtain half or more of their total calories from fat Data in the table on page 32 give more details as to the actual contribution made by different types of foods to the total fat in the average American diet

People who are accustomed to this amount of fat in their diet are quite unhappy when they cannot have it The psychological value of visible fat in the diet is far greater than that of the hidden or invisible fat, although physiologically the latter serves the same purpose

There is no physiologic proof that the human body needs as much fat as Americans consume, but it is recommended by experts that not less than 20 to 25 per cent of the total calories in the American diet should be in the form of fat. That this much fat is not a physiologic necessity for all people is demonstrated by the extremely low fat diets used by large population groups in southern and eastern Europe and in Asia In eastern Asia, for instance, there is less than 20 per cent of total fat in the diet as compared with two or three times that amount in the American diet.

Fats serve a multiple purpose in the diet Some act as carriers of essential fatty acids and vitamins, and all give satiety value to a meal The satisfaction [illegible]

dishes without fat Thus, the morale value of fats is always high. During both world wars fats were in short supply, and there was more popular com-

[1] McCann, M B, and Trulson, M F J. Am Dietet A 33 358, 1957.

plaint about fats than about almost any other food, although there was no evidence of malnutrition. The increased consumption of fat mentioned above is probably a more serious health hazard than any temporary shortage. This will be discussed in more detail later in this chapter.

FOOD FATS—DEFINITION AND CLASSIFICATION

The class of food constituents known as fats includes those which are fluid at room temperature, commonly called oils, as well as those which are usually solid and called fats. They all have similar chemical structure and properties. They are compounds of fatty acids and glycerol—a complex structure of carbon, hydrogen and oxygen—insoluble in water and greasy to touch.

There should be a clear distinction in everyone's mind between oils which are true fats and the hydrocarbon oils derived from petroleum, such as lubricating oil or purified mineral oil. The latter contain carbon and hydrogen but no oxygen. Mineral oil is completely indigestible in the animal body and cannot be classed as a food. Formerly, it was used in place of true fats in certain special low-calorie diets. This procedure is generally discouraged because mineral oil tends to interfere with the absorption of all the fat-soluble vitamins. It is particularly detrimental when used in a food such as salad dressing and when taken with meals.

In natural fats there are a number of different fatty acids, which give to each its specific taste and texture. The fat of cold-blooded animals—fish, for example—is a soft fat which remains plastic in the low-temperature environment in which the fish live. The fats of warm-blooded animals have higher melting points but are also plastic at the body temperature of each species. As a rule, the fat of herbivorous animals is harder than that of the carnivorous. When adipose tissue of animals is subjected to heat, the fat liquefies and separates from the connective-tissue cells in which it was stored. Thus pork fat is "tried out" in the manufacture of lard.

For practical convenience a distinction is often made between the food fats which are purchased or used as such—known as visible fats (butter, margarine, lard, cooking fats, salad oils) and the so-called invisible fats which are a part of our natural foods (the fats of meat, milk, cheese, eggs, cereals, nuts). This distinction is not literally correct or always consistent. The butter or margarine in cake or on a vegetable is not visible, and the fat on a beef steak is visible, but we accept the classification for convenience.

The visible fats most used in the United States are lard, butter, margarine and cooking fats. The last two are usually made from the relatively less expensive vegetable oils, such as cottonseed oil and soybean oil, by the process of hydrogenation. This chemical process involves the introduction of hydrogen into the fat molecule under carefully controlled conditions to produce a fat with exactly the right melting point and other properties for culinary purposes. Fat thus formed is homogenized to form a creamy smooth product, but evidence of its being a mixture is given by the grainy texture of such a fat once it has been melted and allowed to harden again—the high and the low melting point ingredients are no longer evenly mixed.

Margarine is processed largely from vegetable oils by hydrogenation and then churned with cultured milk to give the flavor of butter. All brands are fortified with vitamin A to the equivalent of average butter, and some have vitamin D added. Nutritionally, fortified margarine is practically the equivalent of butter, and the usual cost is about half or less. One table spread now offered is a mixture of butter and margarine.

COMPARATIVE COMPOSITION OF FATS.* FATTY ACIDS AS PER CENT OF TOTAL ACIDS

	SATURATED	UNSATURATED ACIDS			
FAT	ACIDS RANGE	OLEIC RANGE	LINOLEIC RANGE	LINOLENIC RANGE	ARACHODONIC AVERAGE
Butter	46–48		4	1.2	0.2
Coconut oil	75–88	5–8	1–2		
Corn oil	11–15	25–40	46–66		
Cottonseed oil	21–30	22–36	34–57		
Lard	43	46	10–15		0 5
Linseed oil	6–12	13–31	10–27	30–64	
Margarine	15–23	59–77	5–11	0–1	0
Olive oil	8–16	53–86	4–20		
Peanut oil	14–22	44–65	20–37		
Shortening	17–45	43–79	3–12	0–1	0.5
Soybean oil	11–18	18–58	28–62	1–10	
Tallow	53	42	— 5	0 5	0.5

* Rathman, D M Vegetable Oils in Nutrition, New York, Corn Products Refining Co, 1957.

ESSENTIAL FATTY ACIDS

The types of fatty acids in natural fats are responsible for differences in texture, melting point and other characteristics Some fatty acids are "saturated," meaning that each carbon atom in the long-chain molecule carries all of the hydrogen atoms possible Fats formed from such fatty acids are usually solid at *room temperature* An "unsaturated" fatty acid is one in which one or more of the carbon atoms fail to carry all of the hydrogen atoms possible. The unsaturated fatty acids are found mostly in oils from seeds and fish or in softer fats Some of the more highly unsaturated fatty acids cannot be synthesized within the body from other fatty acids but are necessary for growth and health These are *known as essential fatty acids* and must be supplied in the food The three now recognized as essential are linoleic, linolenic and arachodonic, the first two so named because they were discovered in linseed oil. Linoleic is the most widely distributed and the most important one of the three

A deficiency of essential fatty acids has been demonstrated experimentally in animals, and one type of eczema in children responds to treatment with natural fats carrying these unsaturated fats. Infants seem to grow better and on fewer total calories when there is an adequate supply of essential fatty acids The human requirement for essential fatty acids is not known, nor is their exact function in the body understood Recently, as a result of clinical observa- [illegible]

has been raised as to whether or not changes in the American food pattern [illegible] enough to become a health hazard (Changes in American food habits were discussed in Chap 1)

Only recently have common foods been analyzed for the essential fatty acids, and data are still incomplete. A partial list of fats and oils showing the range of saturated and unsaturated fatty acids in each is given in the table on

page 31. Of the four unsaturated acids listed, only the last three are considered to be essential, and of these linoleic is the one most often present. Oleic is listed with the unsaturated group, but it is less unsaturated than the others and does not appear to have the distinct characteristics that have given the designation "essential" to the other three.

FATS IN HOUSEHOLD DIETS—1955*

FOODS	FAT PER CENT	SATURATED FATTY ACIDS PER CENT	LINOLEIC ACID PER CENT
Milk, dairy products	25	39	8
Beef, veal, lamb	14	17	2
Pork, bacon, lard	24	23	23
Margarines, shortenings	13	7	9
Oils, salad dressings	6	3	28
Poultry, eggs, fish	6	5	7
Baked goods, nuts, fruits, vegetables	12	6	23

* Coons, Callie Mae Fatty acids in food, J. Am. Dietet. A 34 242, 1958

In addition, there are invisible fats in many foods, and some of these contribute appreciable quantities of essential fatty acids From recent studies we have some figures on the consumption of foods in American households. From these data, Coons has calculated the relative contribution that each class of foods makes to the total fat consumption and to the saturated and unsaturated types of fat (table, p. 32). Linoleic acid is the significant one of the unsaturated group and thus is used here as a measure of the essential fatty acids. This logical grouping of foods according to the proportion of saturated and unsaturated fats is needed as a practical guide for planning and evaluating therapeutic diets should this become necessary. The first two groups contribute about five times as much saturated as unsaturated fats. The next two groups provide about equal amounts of saturated and unsaturated. Oils and salad dressing are unique in that the unsaturated fraction is about

TOTAL FAT AND SELECTED FATTY ACIDS IN DIETS, HOUSEHOLDS IN THE UNITED STATES AVERAGE PER PERSON PER DAY APRIL-JUNE, 1955*

FOOD GROUP	FAT TOTAL GM	SATURATED FATTY ACIDS GM.	OLEIC ACID GM	LINOLEIC ACID GM
Beef, veal, lamb	22.1	11.0	8.8	0.4
Pork (excl bacon, salt pork)	15.1	6.0	7.6	1.5
Poultry, fish	4.4	1.2	1.6	.8
Bacon, salt pork	13.4	5.4	6.7	1.3
Lard	9.2	3.7	4.6	.9
Other shortening	9.0	2.2	5.8	.7
Oils, salad dressing	9.3	1.9	2.8	4.6
Margarine	10.4	2.6	6.4	.8
Butter	10.6	7.0	2.9	.4
Milk, cream, ice cream, cheese	28.0	18.5	7.6	1.0
Eggs	5.6	2.0	2.5	.4
Other foods (purchased baked goods, nuts, fruits, vegetables, etc)	18.0	3.6	9.0	3.6
Total	155.1	65.1	66.3	16.4

* Food Consumption and Dietary Levels of Households in the United States, Spring 1955, Agricultural Research Service, U S. Department of Agriculture, Aug , 1957.

10 times the saturated. The last two groups vary widely but in general provide more linoleic than saturated fats

A more complete picture of fat consumption in the United States has been calculated from the 1955 food consumption survey[2] An average of 155 Gm of dietary fat per person per day is used—perhaps from 10 to 15 per cent being wasted. For regional differences in type and amount of fat consumed the student is referred to the publication *from which this table is taken* Here again it will be noted that oils and salad dressings contribute by far the most linoleic acid (4 6 Gm) in spite of making up only a small fraction of the total fat. As this edition goes to press it is impossible to make definite recommendations about fat consumption, either as to type or amount. There is general agreement that "overweight" in terms of excess body fat is a serious risk to health. The human requirement for the essential fatty acids is not known, but research now in progress in many laboratories should yield more definite information within a few years

DIGESTION AND ABSORPTION

Fats require special digestive action before absorption because the end products must be carried in a water medium, blood and lymph, in which fats are not soluble All fats are finely emulsified in the intestines by the action of the bile and the bile salts Part of the emulsified fat is split by enzyme action into fatty acids and glycerol Lipase is the term applied to an enzyme which splits fats. A gastric lipase may digest some of the fats already in an emulsified form in foods such as cream and egg yolk The more active enzyme is pancreatic lipase, found in the small intestine, which can split the fat that has been emulsified by bile action The increase in surface area affected by emulsification is enormous and thus gives the enzyme a better chance for action The emulsification also makes possible the absorption of some of the undigested fat globules, as well as the fat-soluble vitamins, directly into the lacteals.

The portion of the fat which is split by enzyme action may be absorbed either via the lacteals into the lymphatic system or directly into the portal blood via the intestinal capillaries (*See* diagram, Fig. 9.)

In either case the present concept is

some of the minute globules of natural fat are absorbed as such The mixing of fatty acids from various food sources and from stored fat makes possible the synthesis of fats needed for specific tissues. Some of the fat combines with phosphate radicals to form phospholipids or with cholesterol to form esters Any of these lipids which are absorbed via the lacteals are transported as an emulsion in lymph via the thoracic duct to the left subclavian vein in the left shoulder, where the lymph flows slowly into the rapidly moving blood stream The blood then carries the fat compounds to all the tissues

The digestibility of fats varies to some extent, the softer fats—those with the lower melting point—are digested more completely by man than those with the higher melting points Butterfat, with a melting point of 32° C., is digested with a loss of only 3 per cent, beef fat, with a melting point of 45° C, with a loss of

Digestion and absorption of fat may also vary with age, infants have a limited ability to utilize fats, and some elderly people have a poor tolerance for fatty foods.

Foods which are surrounded by coatings of fat, especially if the food is satu-

[2] Food Consumption and Dietary Levels of Households in the United States, Spring, 1955, Agr Research Service, Aug, 1957

rated to any extent, as in the case of some fried foods, are often much delayed in their passage through the stomach. The temperature of the fat used in frying should be controlled carefully. Cooking of the fats at high temperatures sometimes reached in frying brings about changes which make digestion more difficult. The glycerol of the fat may break down into irritating substances, and some changes may occur also in the fatty acids when subjected to high temperatures For these reasons and because they may introduce an ex-

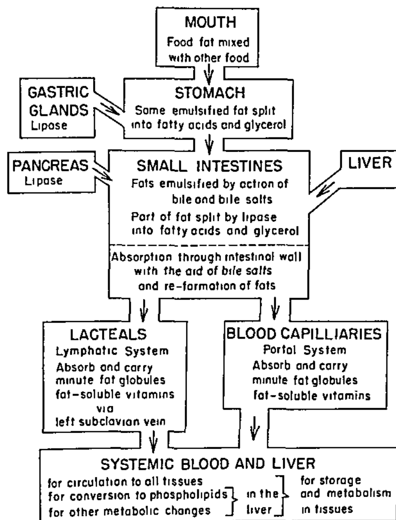


Figure 9

cess of fat, fried foods usually are withheld from sickroom dietaries

METABOLISM AND STORAGE

To a certain extent, fats and carbohydrates are interchangeable as sources of energy. Both yield energy when oxidized by the tissues However, their oxidation proceeds along different lines The utilization of carbohydrates was described in the previous chapter.

Fats are more concentrated than carbohydrates and when oxidized yield 2¼ times as many calories per unit of weight Fatty acids have a greater concentration of carbon and therefore yield more energy. Even so, fat foods are a more expensive source of calories than carbohydrate foods—a fact reflected in the low consumption in countries where people are living on a low economic level

During metabolism, fatty acids and glycerol follow different paths in the process of oxidation The fatty acids are broken down by several stages to smaller molecules, and eventually to carbon dioxide and water, with the release of energy. The glycerol fraction is oxidized through some of the same stages as the carbohydrates.

In certain diseases the intermediary products of fat metabolism, namely, acetone, diacetic acid and beta-hydroxybutyric acid, may be produced in such quantities that their further metabolism to carbon dioxide and water cannot keep pace with their production. They increase in the blood stream and may be excreted in the urine The volatile member of the group—acetone—may give rise to a characteristic odor of the breath The chemical structure of two of these compounds classifies them as ketones and is the basis for the term *ketosis* Two of these ketones have acid properties, therefore, another term for this condition is ketone acidosis. Ketosis may occur in severe cases of diabetes, also in starvation when the body is burning its own fat (Chap 22).

The fat not needed for immediate use is stored in the body depots as adipose tissue to be drawn upon in any emergency. Body fat may also be formed from carbohydrates (Chap 2) and to a lesser extent from the proteins This storage of fat is valuable in assisting in the regulation of the body temperature, as the layer of fat beneath the skin acts as a nonconductor and prevents excessive radiation or loss of body heat It also serves to protect the body from mechanical injury and acts as a support to vital organs, particularly the kidneys. Too great a deposit, on the contrary, results in obesity and may put an unnecessary burden upon the heart and other organs

The relatively high consumption of fat in the United States and certain other countries may predispose to obesity, not because fat foods necessarily produce fat but because people who eat a high fat diet can overstep so easily their caloric needs. On the other hand, when a high caloric diet is necessary for therapeutic purposes it cannot be accomplished without a generous amount of fat.

OTHER LIPIDS

In addition to fats, the phospholipids and the sterols play very important roles in metabolism. The *phospholipids* are compounds consisting of a fat to which is attached a phosphoric acid radical and a nitrogen-containing base Two of the most important of this group are lecithin and cephalin, both cellular constituents. The phospholipids occur in relatively large amounts in the brain, the liver, the heart, the kidney, the lungs and, to a lesser extent, in all voluntary muscles. Egg yolks are also a rich source

Lecithin, a water-soluble derivative of fats, undoubtedly plays an important part in fat metabolism, but exactly how and to what extent have not been determined. Choline, a part of the lecithin molecule, is now known to be essential to the prevention of fat accumulation in the liver, a condition known as "fatty liver disease." Other substances have

been found to participate in preventing fat deposits in the liver.

The two most common sterols are ergosterol, found in plants, and cholesterol, found in animal tissues. Cholesterol, an essential constituent of many cells, especially nerve and glandular tissues, is found in high concentration in the liver, where it is stored, and in the blood, by which it is transported in the body Surplus calories, especially those consumed as fat, sometimes increase the synthesis of cholesterol in the body beyond actual needs. This excess cholesterol circulating in the blood may combine with other lipids and with protein to form large molecules of a complex compound which cannot be easily transported or eliminated from the body. The deposition of some of these large molecules in the walls of certain arteries is a phase of the pathologic condition known as atherosclerosis Epidemiology studies of the incidence of cardiovascular disease seem to show considerable correlation with the high consumption of fats in the United States and several other countries. Experimental studies and clinical observations also point toward an association of these factors, but there are some puzzling and contradictory findings which make it premature at this time to conclude positively that surplus fats or any particular types are responsible for cardiovascular disease. Older people who gain weight easily or who have high blood cholesterol are advised to reduce their fat consumption as a precaution

Cholesterol is excreted from the body by way of the bile When the mechanism for disposing of it is inadequate, cholesterol may appear in gallstones

Ergosterol and other plant sterols are not easily absorbed by man or animals and have no relation to any pathologic change in humans Both cholesterol and ergosterol are precursors of vitamin D, which is produced by the irradiation of these sterols with ultraviolet light (Chap. 7).

Lipids also form complex compounds with proteins, known as lipoproteins Some are water soluble and act as transporters of lipids such as cholesterol in the blood stream Sometimes these larger molecules of lipoproteins are deposited in the arterial walls in the degenerative disease atherosclerosis. (*See* Chap 27.)

STUDY QUESTIONS

1. Name 5 foods which consist in large part of fat

2 Are fats a cheap or an expensive food source of calories?

3. Mineral oil was popular for a number of years as a substitute for fat on low-calorie diets. Why is this not advisable?

4 How are cooking fats and margarine manufactured? Does this process alter their food values?

5. What is added to margarine to give it the flavor of butter? What is added to make is nutritionally equal to butter?

6. Name the "essential" fatty acids. Are these freely distributed in foods containing fat? Which of the three is most important?

7 Do the highly unsaturated fatty acids seem to have any effect on the level of blood cholesterol?

8. What are the end products of fat digestion? What are the pathways of absorption? What are the end products of fat metabolism?

9. In diabetes there may be an accumulation of partially metabolized fats. What are these called? How may they be detected?

10 Besides its use for energy, what other functions does fat perform in the body?

11 What are phospholipids? Sterols? Where are they found in the body? Which sterols may be converted to vitamin D?

See Bibliography in Part Four for other pertinent material on the topics discussed in this chapter.

CHAPTER FOUR

Proteins

IMPORTANCE AND WORLD USE

Every animal, including man, must have an adequate source of protein in order to grow or maintain itself

Proteins have long been recognized as the fundamental structural element of every cell of the body. More recently specific proteins and protein derivatives have been recognized as the functional elements in certain specialized cells, glandular secretions, enzymes and hormones Thus, protein well deserves its name, which is of Greek derivation, meaning "of first importance" Since proteins are the principal constituents of the active tissues of the body and the body is dependent upon food protein for these indispensable substances, the quality and the quantity in the daily diet are of prime importance

In many parts of the world, food sources of protein, especially good protein, are extremely scarce There is some evidence that in countries where the quality and the quantity of protein are inadequate, the stature of whole groups of people may be affected Peoples depending largely on plant sources of protein with little if any animal foods tend to be short in stature. It is well known that most Orientals and Indonesians are short, also, the average stature of the peoples in the Mediterranean area is less than that of northern Europeans. A study of Orientals who have lived in California for a generation or more has demonstrated a marked increase in stature—evidence that heredity was not the only determining factor. On the other hand, Australians and New Zealanders have large and strong physiques and they are probably the heaviest meat eaters on the globe

The United States has ample sources of protein, and the average person consumes an adequate amount However, even in this country there are some people who, for economic or other reasons, may not get enough protein.

COMPOSITION AND ORIGIN

Proteins, as well as fats and carbohydrates, are composed of carbon, hydrogen and oxygen, but in addition they contain nitrogen, usually sulfur and phosphorus and sometimes iron Chemically pure proteins are fairly stable, but in a moist state in which they generally are found in foods they decompose readily at room temperature This spoil-

age is due to bacterial action and may form substances toxic to the body. In this respect, nitrogenous foods are more unstable and will decompose more readily than carbohydrates and fats. Therefore, protein foods such as fresh

Plants can synthesize protein elements from the nitrates and the ammonia in soil and in decaying vegetable matter, along with water and carbon dioxide from the air. Animals are dependent upon plants for this synthesis because animal cells cannot utilize the simpler *forms of nitrogen. Animal metabolism of* protein eventually yields the forms of nitrogen which the plant alone can utilize. Frequently, this sequence of events is called the nitrogen cycle

AMINO ACIDS

Proteins are made up of nitrogen-containing compounds known as amino acids, held together in a chainlike chemical structure Proteins are among the

The first one of the amino acids was discovered over 125 years ago, but the last of the 22 listed below was isolated and identified in 1935 by W C. Rose During the century between these discoveries much of the basic chemistry and physiologic significance of proteins came to be understood With the realization that amino acids were important

mental research was done with experimental animals, the pioneer work by Osborne and Mendel, and much of the later work by Rose, a former student of Mendel.

According to Rose[1] and later studies by Albanese[2] on infants, there are 10 essential and 12 nonessential amino acids for growth. These are as follows:

CLASSIFICATION OF AMINO ACIDS WITH RESPECT TO THEIR GROWTH EFFECTS

Essential	*Nonessential*
Lysine	Glycine
Tryptophan	Alanine
Histidine*	Serine
Phenylalanine	Norleucine
Leucine	Aspartic acid
Isoleucine	Glutamic acid
Threonine	Hydroxyglutamic acid
Methionine	Proline
Valine	Hydroxyproline
Arginine†	Citrulline
	Tyrosine
	Cystine

* Adults may synthesize histidine in the tissues or by intestinal micro-organisms.

† Arginine can be synthesized by the animal organism but not at a sufficiently rapid rate to meet the demands for normal growth.

Subsequent work on human subjects has demonstrated that only 8 of the 10

may be necessary for growth of children, as they are for growth of animals.

The minimum adult requirement of each of the 8 essential amino acids was determined by Rose,[3] but as yet we do not know the quantity of each amino acid necessary for optimum growth of children. As research continues to build up our knowledge of proteins and human need, we shall know better how

[1] Rose, W C. Physiol Rev. 18 109, 1938, Nutrition Abstr & Rev. 27 631, 1957.

[2] Albanese, A A.: Am J Clinical Nutrition 1·44, 1952.

[3] *Op cit*

to meet those needs from widely varied food sources.

The nurse, as well as the physician and the dietitian, should be able to recognize the names of the essential amino acids, if not all of them. Lysine is now mentioned on the label of certain kinds of bread, where it is being used to supplement the wheat protein which is low in lysine. Tryptophan is the precursor of one of the B vitamins—niacin—and such will be discussed in Chapter 8. Methionine and cystine are the only amino acids containing sulfur, and for this reason they have special functions in metabolism. These few examples and others mentioned later in this chapter may serve to emphasize the unique importance of each amino acid and to explain why such extensive research is in progress in this field.

When it was first demonstrated that a person could be maintained in nitrogen equilibrium on a mixture of pure amino acids without any protein food as such, it changed our concept of the unique role of protein in the diet. For practical purposes, however, protein is our food source of amino acids because no one would choose to eat amino acids in place of protein. A protein hydrolysate, a mixture of amino acids, made from a natural protein by enzymatic or acid hydrolysis is most unpalatable and tends to disturb the digestion if taken by mouth. The use of hydrolysates is usually limited to emergency intravenous feeding.

QUALITY OF PROTEINS

Proteins in natural foods differ widely in the number and the proportion of the 22 or more amino acids that they contain. A good-quality protein or a complete protein is one that supplies all the essential amino acids in sufficient quantities for normal growth and maintenance. When tested experimentally, proteins such as ovovitellin from egg yolk or lactalbumin from milk are capable of supporting growth in young rats when fed at a relatively low level in the ration. This indicates that they top the list of good-quality proteins. In

gelatin—derived from animal connective tissue, an example of incomplete protein.

Proteins from plant sources are not usually of as good quality as those from animal sources. The amino acid structure of plant cells naturally differs from that of animal cells. The best quality plant proteins are found in legumes, such as beans, peas and peanuts and in nuts. Proteins in certain green leaves and vegetables are good in quality but extremely limited in quantity. Grains in general contain rather poor quality protein.

A protein which can support neither growth nor maintenance in an experimental animal is called incomplete. One which can support maintenance but cannot promote growth is sometimes called partially incomplete. Usually, more than one protein is present in a single food such as corn. Zein, one of the proteins of corn, is a classic example of an incomplete protein. Zein lacks two of the essential amino acids. Young rats cannot grow or even survive when zein is the sole source of protein in their diet. Gliadin from wheat is another incomplete protein.

Fortunately, most of our foods contain a mixture of proteins, one of which often supplements another. More to the point is the fact that we combine several foods in a meal, and the proteins from different types of foods tend to supplement one another because of their different amino acid content. For instance, cereals which are low in lysine usually are eaten with milk, which provides a generous amount of this factor. Thus, cereal and milk or bread and cheese are good combinations because

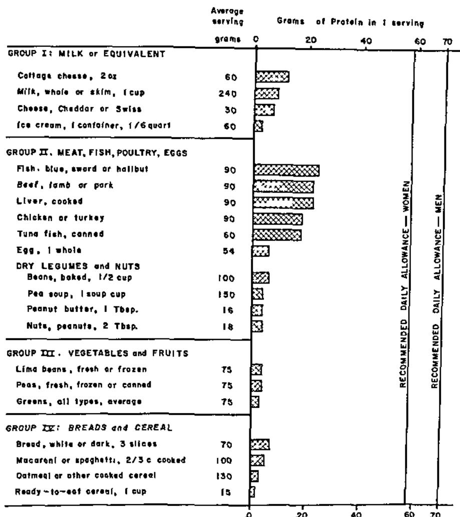


Figure 10

the proteins supplement each other. It is obvious that this type of supplementary value among foods makes a varied diet much safer than a restricted one Cereal products may contribute more than one half the protein in certain countries where foods of animal origin are scarce.

FOOD SOURCES

From Figure 10 it is evident that the best sources of protein are in the first

two groups, the Milk Group and the Meat Group These groups also supply the best quality protein as well as more per serving Dry legumes and nuts are included as alternates in the meat group because they provide the best-quality plant protein and in some countries must serve as a major source of protein

Proteins are somewhat modified in physical properties and in physiologic availability by heat In ordinary cook- [illegible]

to cause toughening An egg cooked [illegible]

lower than 300°, to get the best results for more tender meat as well as to lessen shrinkage The nutritive value of soybean protein is improved by autoclaving soybeans before processing as flour or grits On the other hand, the high temperatures used in processing certain ready-to-eat cereals reduce the protein value by the destruction of one or more amino acids

[illegible]

[illegible] the difference in temperature and time in meat cookery makes the roast that is overdone at high temperature appear to have the higher protein content because the one roasted at lower temperature with less shrinkage did not lose as much moisture (See Table 1, Part Four.)

PROTEIN METABOLISM

The digestion of protein in the alimentary tract is accomplished by the action of the three proteolytic enzymes [illegible]

small traces of peptides (compounds of two or more amino acids) that escaped being split apart. The amino acids are absorbed directly into the blood stream through the intestinal capillaries and are carried by the portal blood first to the liver and then to all tissues and organs of the body (Fig 11)

The body makes such combinations of these amino acids as are necessary to build up its own kind of body protein, provided that the essential amino acids are present all at once in adequate amounts No two types of tissue have exactly the same composition, muscle, liver, kidney, blood, skin, etc , must each have the specific types and amounts of these "building stones" to complete its structure or replace used materials

Enzymes, hormones and internal secretions each contain combinations of specific amino acids or their derivatives The specificity of function of amino acids is gradually being disclosed Tyrosine and phenylalanine are necessary constituents of thyroxin—the endocrine secretion of the thyroid gland Histidine is essential for the synthesis of histamine, a regulatory compound in the blood stream Insulin demands 7 specific amino acids for its synthesis by the pancreatic cells The simple amino acid glycine can combine with certain toxic substances to make them harmless until excreted.

By ingenious research methods it has been demonstrated that a tissue must have all of the essential amino acids for a particular job—cell growth or tissue synthesis—presented to it by the blood stream at the same time A missing amino acid cannot be supplied several hours later and find the other essential ones on the job waiting until all can be assembled. This fairly recent finding emphasizes the need for protein of good quality, providing all essential amino acids, at every meal

After the blood stream has delivered the requisite amino acids to the various tissues and has collected the discard or surplus amino acids from the tissues, it

PROTEIN

In Average Servings of Foods Classified in the Four Groups

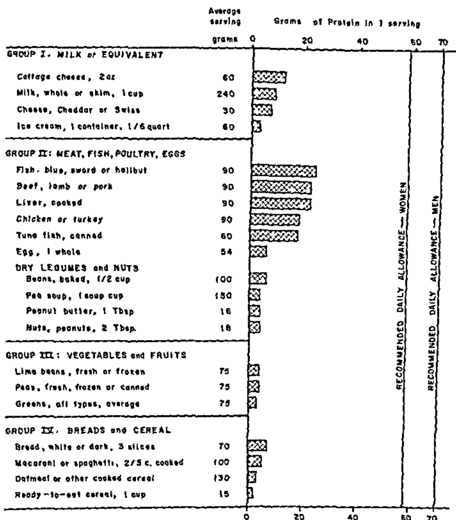


Figure 10

the proteins supplement each other It is obvious that this type of supplementary value among foods makes a varied diet much safer than a restricted one. Cereal products may contribute more than one half the protein in certain countries where foods of animal origin are scarce.

FOOD SOURCES

From Figure 10 it is evident that the best sources of protein are in the first

two groups, the Milk Group and the Meat Group These groups also supply the best quality protein as well as more per serving Dry legumes and nuts are included as alternates in the meat group because they provide the best-quality plant protein and in some countries must serve as a major source of protein

Proteins are somewhat modified in physical properties and in physiologic availability by heat In ordinary cook- [illegible]

[illegible] product, while high temperatures tend to cause toughening An egg cooked below the boiling point is more tender than a "boiled" egg Meat-cookery experts recommend temperatures between 300 and 350° F., and sometimes even lower than 300°, to get the best results for more tender meat as well as to lessen shrinkage The nutritive value of soybean protein is improved by autoclaving soybeans before processing as flour or grits On the other hand, the high temperatures used in processing certain ready-to-eat cereals reduce the protein value by the destruction of one or more amino acids

The percentage of protein in cooked foods, either meat or vegetables, depends upon the amount of moisture that may have been added or lost in cooking.

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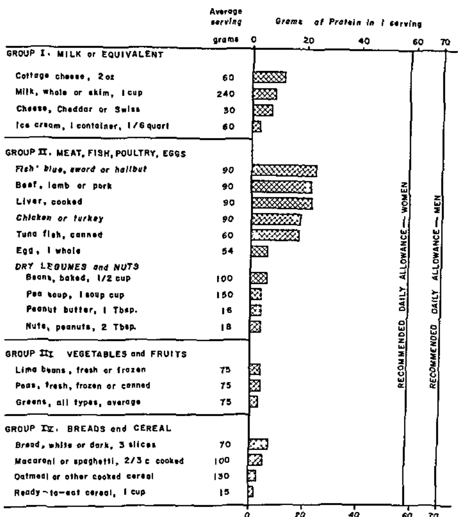


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More complex protein derivatives give rise to other nitrogenous end products in the urine—uric acid and creatinine.

stable chemical combinations that remain static once they are formed Modern research has demonstrated that all tissues are in a state of dynamic equilibrium, which means that they maintain a constant composition while certain components are breaking away and being replaced by others derived from food or the body's current surplus.

The complexity of the chemical processes involved in protein metabolism, as well as the need for protein as a tissue builder, indicates why it is not an economical fuel food However, from a practical point of view, man's choice of food protein should provide an intake well above actual needs to make sure of an adequate supply of the essential amino acids The necessary margin of safety means that usually there will be a surplus that must be deaminized and used like a fuel food, as surplus scrap wood left from building a house may be used for fuel, although the original material was not procured for that purpose.

PROTEIN REQUIREMENTS

Any quantitative estimate of protein requirement must take into account the quality of proteins involved The Food and Nutrition Board recommends 70 and 58 Gm of protein per day for men and women, respectively (i e , from 10 to 15% of the total calories or 1 Gm per Kg of body weight per day) The allowances for growing children are higher per unit of weight to meet the needs for growth The pregnant woman

The trend at the present time is toward an increasingly liberal protein allowance for all ages, to provide for less obvious needs as well as for growth and maintenance. It is suggested, for instance, that a liberal protein intake tends to increase immunity or resistance to infections However, experimental evidence and the results of wartime restrictions indicate that the human body has an ability to adapt itself to widely different protein levels of intake Scientific observations of people living on drastically limited food supplies, low in protein and of poor quality, during World War II afford further evidence regarding the amazing human adaptation to such restrictions

In ordinary peacetime circumstances and with a moderate income, the average person is apt to meet his protein requirement without difficulty It is con-

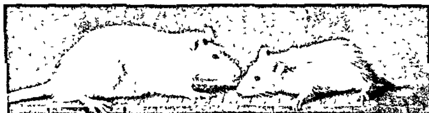


Fig 12 Adequate and inadequate protein (18 per cent vs. 4 per cent). Rats of the same litter. This deficiency produces stunted growth but no deformities.

carries them back to the liver. Neither surplus protein nor amino acids can be stored to any extent in the body. The liver serves as a redistribution and disposal center for amino acids Those not needed are deaminized, that is, the nitrogen part (NH_2) is split off, and the non-nitrogenous part is used along with sugars and fats for fuel. Slightly more than half of the protein molecule may be converted into sugarlike compounds (glucogenic) to be used as an immediate source of energy, stored as glycogen or converted into fat for storage as adipose tissue The ultimate end products of the oxidation of this portion of the protein molecule are CO_2 and H_2O, the same as for fat and sugar (Fig. 11).

The nitrogenous portion of the amino acids split off by enzyme action in the liver may be used again in the resynthesis of certain simple amino acids needed by the body, or it may be discarded The largest proportion is waste nitrogen, and most of it is formed into the simple compound urea by the liver cells and in that form is transported by the blood to the kidneys for excretion

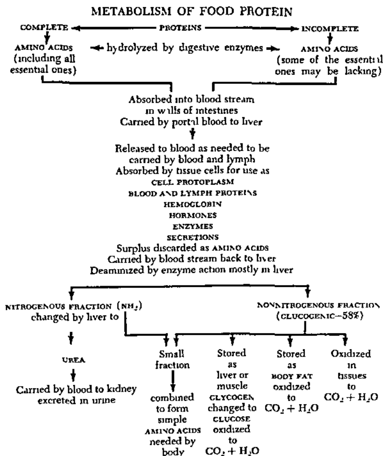


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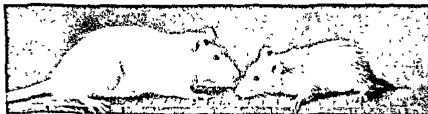


Fig 12. Adequate and inadequate protein (18 per cent vs. 4 per cent). Rats of the same litter This deficiency produces stunted growth but no deformities.

PROTEIN IN PATTERN DIETARY FOR 1 DAY*

FOOD GROUP	AMT IN GM	HOUSEHOLD MEASURE	CALORIES	PROTEIN GM
Milk or equivalent	488	2 c. (1 pint)	332	17
Egg	54	1 medium	77	6
Meat, fish, fowl	90	3 ozs cooked	257	23
Vegetables.				
Potato, cooked	100	1 medium	83	2
Green or yellow	75	½ c cooked	18	2
Other	75	½ c. cooked	39	2
Fruits				
Citrus	100	1 serving	41	1
Other	100	1 serving	85	1
Bread, white, enriched	70	3 slices	189	6
Cereal, whole grain or enriched	30	¾ c cooked or 1 oz dry	80	2
Butter or margarine	14	1 tablespoon	100	
Total			1,301*	62

* For basis of calculation see Basic Dietary Pattern in Chapter 18

sidered highly desirable for at least one third of the protein to be derived from animal sources, and the recommended allowances make this assumption It is also recommended that some source of good protein be included in each meal for reasons stated earlier in this chapter Since protein foods of high biologic value are the most expensive class of foods in the diet, there is a tendency among some low-income groups to consume less than recommended amounts of protein and often of poorer quality From Figure 10 it is easy to estimate the number of servings of protein foods necessary to meet the day's recommended allowance

A basic dietary pattern for one person for a day is often used in planning

The protein requirement may be modified by certain pathologic and environmental conditions. Physiologically, hard physical labor increases caloric but not protein requirements. However, in actual life, men engaged in heavy work want protein foods as part of their extra calories, and this means that the protein intake is more than that recommended for active men During convalescence from debilitating diseases or from surgery, extra protein seems to hasten recovery and the regaining of strength. In cold climates a higher protein intake may be desirable due to the specific dynamic action which tends to increase body-heat production The earlier tendency to reduce protein intake in many diseases has been rather generally reversed, with a few exceptions, due to recent favorable results from the use of more liberal protein diets

The history of research into human protein requirements provides some dramatic contrasts of opinion Late 19th-century investigators of the subject advocated from 100 to 150 Gm of protein as a daily optimum, the figures being based on observations of what people were actually eating. The estimates tended to be high because meat consumption was liberal in the 19th century in central Europe where these scientists were living Early in this century,

Chittenden, at Yale, conducted a scientific study on a number of students and faculty, and found that they could remain in nitrogen equilibrium on less than a third of the amount of protein previously considered necessary. Other investigators championed the cause of low protein, believing that the products resulting from protein metabolism, in excess of actual body needs, were harmful.

For the last 30 years or more the emphasis has been on an adequate supply of good-quality protein well above minimum requirements Our present concern for a good balance of amino acids at every meal has drawn attention to the supplementary values of natural proteins and the possible fortification of poor-quality proteins with the missing amino acids. The latter procedure is seriously questioned, however, because too little is known about the desirable balance of amino acids for optimum nutrition

Today, more than ever before, an effort is being made through such United Nations agencies as FAO, WHO and UNESCO to search for additional sources of good protein, especially in those parts of the world where animal foods are scarce and expensive and children particularly are suffering from protein deficiencies (*See* Chap. 20)

STUDY QUESTIONS

1. Why is good-quality protein important for breakfast as well as for other meals?

2. For what specific purposes are proteins used in the body?

3. Why must protein foods be stored in a refrigerator to prevent spoilage?

4 The structural components of proteins are amino acids How many of these are known? Do tissues vary in their requirements for specific amino acids?

5 What is meant by "essential amino acids"? Are the same ones essential for maintenance as for growth? How are the amino acids related to some of the hormones? Illustrate

6 What theory is suggested as to why most Australians and New Zealanders are taller than people of similar racial strains living elsewhere?

7 What are the best food sources of complete proteins? Which food groups furnish the most protein? Compare the quality of protein from plant and animal foods

8 What is the effect of heat on protein? What caution should be observed in the cooking of protein foods?

9 Trace the pathway of proteins through digestion and metabolism What part does the liver play in protein metabolism? What are the end products of protein metabolism? How are these excreted from the body?

10 What are the National Research Council recommendations for protein? Which foods must be included in the daily dietary, and how much of each, [illegible]

of the foods listed and tabulate its fat and carbohydrate content

See Bibliography in Part Four for other pertinent material on the topics discussed in this chapter.

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A basic dietary pattern for one person for a day is often used in planning menus for institutions such as hospitals. This dietary pattern of 1,300 calories provides a liberal amount of protein, more than half of which is from animal sources. Additional foods chosen to supply the extra calories would also provide additional protein (*See* Chap 18)

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one is trying to get rid of surplus storage.

Heat in Relation to Metabolism Heat is the result of combustion of fuels outside the body and also of the oxidation of foods in our bodies Since heat is a by-product of all energy spent as work, heat can serve as a measure of energy metabolism. As it is necessary in scientific work to have measures of length (centimeter, inch) and measures of weight (gram, ounce), so is it necessary to have a measure of heat A calorie is the amount of heat required to raise the temperature of one kilogram of water one degree centigrade In our more common measures, it is approximately the amount of heat required to raise the temperature of four pounds of water one degree Fahrenheit.

MEASURING FOOD CALORIES

A bomb calorimeter is a device for measuring calories, the stored fuel in foods, just as it is for measuring the fuel value of wood, coal or oil The apparatus shown in Figure 13 is carefully designed for measuring all the heat produced by the complete oxidation of an accurately measured amount of any food. The apparatus is insulated thoroughly against loss of heat, and the amount of heat produced is measured by the change in temperature of a measured amount of water.

Physiologic Fuel Values. The calorie value of nutrients determined by the bomb calorimeter must be modified to take account of losses in digestion and excretion From a large number of determinations Atwater derived the well-known physiologic fuel values

Protein	4 calories per Gm
Fat	9 calories per Gm
Carbohydrate	4 calories per Gm.

These values were approximate only, but they served reasonably well when applied to foods ... the ... cies were recognized In the Agriculture Handbook No 8 published by the U. S. Department of Agriculture in 1950,[1] calorie values are calculated by a modification of the procedure that had been in use for 50 years. Instead of applying the general caloric factors 4,9,4 to the percentage composition of food, as had been done previously, more specific fac-

[1] Watt, B K., and Merrill, A. L Composition of Foods Raw, Processed, Prepared, U S Department of Agriculture, Agricultural Handbook No. 8, 1950.

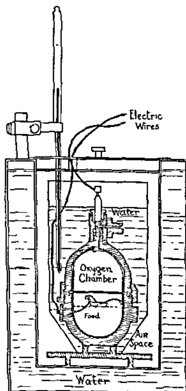


Fig 13 Diagram of the parts of a bomb calorimeter The water in the inner chamber changes in temperature when the food is burned The water in the outer chamber acts with the intervening air space as insulation. (Jean Broadhurst)

CHAPTER FIVE

Energy Metabolism

Atomic power may make the headlines, but solar energy is still the power that makes life on earth possible. However, of all the sun's energy that reaches the earth only a fraction of 1 per cent can be adapted or stored for future use Even the most efficient man-made devices for harnessing some of the sun's energy are less efficient by far than plants Here the amazing process known as photosynthesis uses the sun's light and heat (plus the chlorophyll of the green leaves as catalyst) to manufacture [illegible]

[illegible] synthesis. Thus, the potential or stored energy of the plant world becomes the food of animals who in turn spend that energy in the form of heat and work or store the surplus as body fat. (*See* Fig. 7.)

Metabolism may be used in a general sense to refer to all types of changes which occur to food nutrients after they have been absorbed from the alimentary canal and to the cellular activity involved in utilizing these nutrients Sometimes the word is used in a more specific sense, as in protein metabolism, to refer to the total picture of what happens to protein in the body. These changes, which result ultimately in the combustion of foodstuffs, with the release of heat or energy, constitute what is called energy metabolism.

ENERGY AND HEAT

Energy is expended whenever work is performed by the body in the comple- [illegible]

involved in the performance of one's daily work, or involuntary, such as in the circulation of the blood, respiration, digestion and the maintenance of muscular tone

As the furnace must be fed frequently with fuel in order to meet the expendi- [illegible]

tween the amount of work performed, the heat produced by the body and the total food intake. One cannot perform more work than is provided for by the food intake unless one "borrows" from the reserve supply stored as adipose tissue. This "borrowing" habit is bad unless

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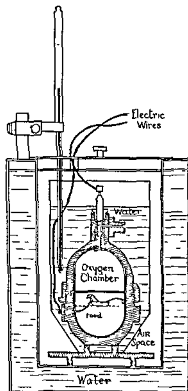


Fig 13 Diagram of the parts of a bomb calorimeter The water in the inner chamber changes in temperature when the food is burned The water in the outer chamber acts with the intervening air space as insulation [Jean Broadhurst]

Energy and Heat
Measuring Food Calories
Measure of Energy Expended
Basal Metabolism
Energy Metabolism Requirements
Other Factors Affecting Total Metabolic Rate

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tween the amount of work performed, the heat produced by the body and the total food intake. One cannot perform

Variations in Basal Metabolic Rates

There are normal variations in basal metabolism, the causes of which lie within the body itself the size, the shape and the composition of the body, the age of the individual and the activity of certain internal glands It is generally accepted that a variation of from 10 to 15 per cent either way from the accepted metabolism rate (all variables considered) is within normal limits. Complete tables of average metabolic rates for men and women of different age, height and weight are used for comparison with the measured rate. The basal metabolism of an average man and woman would be about 1,650 and 1,350 calories, respectively

The surface area of the body is used as a measure of size in these studies

greater the necessary heat production by the individual. It has been found that a tall, slender person has a greater sur-



Fig 14. A respiration apparatus for making basal metabolism measurements. (McKesson Appliance Co.)

tors were used. These new factors take into consideration further research data on the fuel values of foods

The new values for most foods approximate the old values, but they are more accurate for such foods as whole wheat, where there is a large indigestible fraction. For practical purposes, however, it is still possible to estimate [illegible]

fat and carbohydrate

The need for revising the U.S. method of calculating food values was emphasized during World War II, when international committees were concerned with the world's food supply. *They could not talk the same nutrition* language unless they could agree upon methods of estimating the nutritional value of foods As a result, the FAO Nutrition Division published its findings in 1947.[2] The policies and the data given in that publication became the basis of the present method of calculation. *Table 1*, in *Part Four, Composition* of Foods, is based on Handbook No. 8 and some more recent data.

MEASURE OF ENERGY EXPENDED

The actual energy expended by the body throughout a given period may be determined by placing a human subject in a special calorimeter The heat given off by the subject is absorbed by the water in the coils surrounding the well-insulated chamber, where, by an accurate mechanism, the total heat may be measured. This procedure is known as direct calorimetry. As there are in existence only a few calorimeters large enough for making direct observations on human beings, and since they are exceedingly expensive, this method is used chiefly for scientific research.

By another method, known as indirect calorimetry, the rate of metabolism is calculated from the oxygen intake measured by a respiration apparatus. From the oxygen consumed in a given number of minutes the caloric expenditure can be calculated. This principle may be applied to persons engaged in various [illegible]

conditions, or when work is performed in a stationary position, a tank type of apparatus is used. This type of apparatus is now installed in most of the larger hospitals of the country (Fig. 14). The metabolism test is used extensively as a means of diagnosis, particularly *in cases of hyperthyroidism*, hypothyroidism, myxedema and other endocrine disturbances which may alter the metabolic rate.

BASAL METABOLISM

The energy expended under basal conditions includes the work of

1. Maintaining muscle tone
2. The circulatory system
3. Respiration
4. Digestive processes
5. Other glandular and cellular activity.

In order that there may be some basis of comparison for tests, the rate of metabolism must be studied under standard conditions Therefore, it is specified that the subject be lying down, awake and at complete rest, and that the test be taken at least 12 hours after the last meal and several hours after any vigorous exercise

In the morning before breakfast is the most convenient time to comply with these conditions. The rate of metabolism as determined under these "standard" conditions is known as the basal metabolic rate (BMR). Marked variations in the basal rate of metabolism are an indication of *disease*.

[2] FAO Energy-Yielding Components of Food and Computation of Calorie Values, Washington, FAO, 1947.

A Nurse's Activities for 1 Day—Calculation of Energy Expended

	Time Engaged in Activity in Hours	Calories per Pound Per Hour	Calories per Pound Total
Activity			
Asleep	8	0.4	3.2
Lying still, awake	1	0.5	0.5
Dressing and undressing	1	0.9	0.9
Sitting, eating meals, sewing, watching TV	4½	0.7	3.2
On duty (8 hours).			
Walking	1	1.5	1.5
Standing	1	.8	.8
Care of patient	4	1.1	4.4
Reading, writing	2	.7	1.4
Walking to and from work	½	1.5	.7
Recreation			
Playing piano	½	1.2	.6
Dancing	½	2.0	1.0
	24		
		Total per lb	18.2
		Weight in lbs.	130
		Total energy expended for the day	2,366

amount expended by this tissue was minute compared with the total ...

ories per day *In every case the food intake should equal in caloric value the heat units expended by the body* (except, of course, in overweight individuals who find it necessary to reduce). A man doing sedentary work may require only 2,500 calories per day, while a man doing exceedingly hard manual labor may require as much as 5,000 calories The calorie allowances given for different age and sex ...

10). For men, the range is from 3,200 down to 2,550, for women, from 2,300 to 1,800 calories, lower for the older age groups

The table on page 50 gives the average energy expenditure per pound or per kilo for several everyday activities Obviously, not all types have been measured, but in using this table to estimate your own energy expenditure you can use the data for the activity nearest to that in which you were engaged or one which would require similar exertion

Individual variation in the amount of energy spent in performing a given task or activity may be considerable One person may sit so relaxed that he spends no more energy than another may spend lying down. One person makes more motions in doing a job than another Thus, in calculating your own energy expenditure for a day from such a table, you can expect only an approximate figure because of the many variables and the difficulty of estimating the exact length of time spent in each activity Nevertheless, it is interesting to see how your energy intake calculated from food eaten compares with your calculated energy expenditure for the same day.

A nurse weighing 130 pounds and on active duty 8 hours a day may estimate

face area than a shorter, stout person of the same weight, that is, surface area is proportional to height multiplied by weight.

The higher the proportion of active muscular tissue the higher the metabolic rate will be, because fatty tissue has a much lower rate Thus, the athlete will tend to have a higher rate than a sedentary man of the same age and size.

Age and growth are responsible for normal variations in basal metabolism. The relative rate is highest during the first and the second years and decreases after that, although it is still relatively high through the ages of puberty, both in girls and in boys During adult life there is a steady decrease in rate with *a marked drop in old age, due undoubtedly* to lower muscle tone resulting from diminishing muscular activity.

Sex probably has little effect upon metabolism, although women in general have a lower metabolism than men. This may be accounted for by less habitual activity or by a difference in body composition, women usually having a little more fat and less muscular development than men

The internal secretions of certain glands of the body, such as the thyroid and the adrenals, materially affect metabolism The secretion of the thyroid gland has the most marked effect. Hyperthyroidism is that condition in which the metabolism is accelerated by increased production of thyroxine, while [illegible]

affect metabolism to a lesser degree, but their significance in this respect is not well understood

ENERGY METABOLISM REQUIREMENTS

For all voluntary activities the fuel needed is in direct relation to the intensity of the exercise For instance, a moderate amount of energy is needed for walking, while for the heavy labor of digging a ditch or for the active exercise of tennis a considerable amount of fuel is needed

Muscular work is the greatest factor influencing energy requirements. Mental work, strange as it may seem, does not affect the total metabolism sufficiently to be detected easily. Investigators, working with a very delicate apparatus, found that nerve tissue did expend some energy, but that the

ENERGY EXPENDITURE FOR EVERYDAY ACTIVITIES*

	CAL / KG./HR.	CAL./ LB./HR
Asleep	9	.4
Bicycling, mod. speed	3 8	1.7
Cello playing	2 5	1.1
Dancing, foxtrot	5 2	2 4
Dancing, waltz	4 4	2 0
Dishwashing	2 2	1.0
Dressing and undressing	1.9	.9
Driving an automobile	2 1	1 0
Eating a meal	1 5	.7
Horseback riding, trot	5 8	2 6
Ironing	2 2	1 0
Laundry, light	2 5	1 1
Lying still and awake	1 2	5
Painting furniture	2 8	1 3
Playing Ping-pong	5 9	2 7
Piano playing, moderate	2 6	1 2
Reading aloud	1 5	.7
Running	8 8	4 0
Sewing by hand	1 5	.7
Sewing, elec. mach	1 5	.7
Sitting quietly, watching TV	1.4	6
Skating	4.9	2 2
Standing, relaxed	1 7	.8
Sweeping, vacuum cleaner	4 1	1 9
Swimming (2 mi /hr)	9 8	4 5
Tailoring	2 1	1 0
Typing rapidly	2 2	1 0
Walking, 3 mph	3 3	1 5
Walking, 4 mph	4 9	2 2
Writing	1 5	.7

* Adapted from Taylor, MacLeod &

for at least 12 hours For a person on an average diet the specific dynamic action of food may account for about 10 per cent rise above the basal

Climate, season, housing and clothing affect metabolism, chiefly through their bearing upon the regulation of body temperature The heat produced in the body by metabolic processes must be conserved or given off in such a way as to maintain the body temperature at a remarkably constant figure If no heat were lost from the body during average daily activity, the temperature would rise about 2° an hour In winter we purposely curtail our heat loss from the body by wearing heavier clothing and living in heated houses, while in summer we wear thinner clothing to expedite greater losses. However, nature has provided for a carefully controlled loss of heat that may vary as climate and environment dictate. A thinly clothed person on a cold winter day may shiver This process is a series of rapid muscular contractions set up involuntarily in the body to increase heat production in order to make up for the rapid heat loss. Evaporation of perspiration from the skin is a mechanism employed by the body to reduce temperature. Insensible perspiration is evaporating continuously with a slight loss of heat, but sensible perspiration means greater heat loss and affords a welcome cooling effect when the body is overheated in warm weather or after strenuous exercise.

Although essential nutrients should be considered in the selection of an adequate diet, it must not be forgotten that the caloric value is fundamentally one of the most important, as DuBois[3] pointed out when he stated·

"Calories in medical practice are just as important as they ever were, in spite of the fact that attention has been centered on vitamins. No supplements of vitamins or mineral elements can alter the laws of the conservation of energy. Calories are still needed to keep the body warm and to furnish energy for muscular work."

When emergencies arise in war or famine, it is total calories which must be provided first to keep people alive and satisfied The quality and the nature of the calories can be adjusted later to meet specific needs.

[3] DuBois, E F., and Chambers, W. H · J.A M.A 119 1183, 1942

STUDY QUESTIONS

1 Explain the use of the word *metabolism* in the two expressions—"energy metabolism" and "protein metabolism."

2 What is the unit of measure for energy and how is food energy measured?

3. What are the so-called physiologic fuel values? How can they be used to estimate food values?

4 Milk has the percentage composition of 3 5 Gm protein, 4 Gm fat and 5 Gm carbohydrate per 100 Gm Calculate the caloric value of a glass of milk weighing 240 Gm

5 What change in the calculation of caloric value of foods was recommended in 1950 and why was it necessary?

6 What is measured in a basal metabolism test? Under what conditions must the test be performed? Name the factors which affect the basal metabolic needs of any given individual

7 What is the largest single factor affecting the total energy requirements? List other factors which play a part in the total calories needed

8. Calculate the energy requirement

Compare the figures. Is the quick method reasonably accurate?

9 Determine from your study of the previous chapters which foods will con-

her total energy expenditure for the 24 hours from the list of activities. The results of such a calculation are given below as a sample An office girl with less activity would expend considerably fewer calories, but a man weighing more and in sedentary occupation may expend about the same calories as the more active woman.

A quick estimate of the energy needs of a moderately active person may be made as follows

Basal needs = 1 cal./Kg./hr

Weight in Kg × 24 = BMR for 1 day

BMR plus 50% = total energy needs for moderate activity

The increase above the basal is proportional to the degree of activity as indicated in the following table for rough estimation of energy needs

APPROXIMATE INCREASE ABOVE BASAL NEEDS FOR LISTED ACTIVITIES

	PER CENT ABOVE BASAL
Bed rest (hospital patient)	10
Sedentary activity, knitting	30
Light activity, tailor or nurse	50
Moderate activity, carpenter, painter	75
Severe activity, lumberman, stone mason	100

Habitual muscular exercise not only increases the total energy metabolism but affects the basal rate because energy is required to maintain muscle tone. On the other hand, sleep lowers metabolism because the muscles are relaxed. A prolonged period of absolute rest in bed means loss of muscle tone and lowered metabolism

A person who habitually consumes more calories than he expends for work plus body heat tends to store the extra food as body fat (adipose tissue) This is easy to do, especially when one's activities are less than they were previously. Frequently, eating habits are not adjusted to fit reduced activities. There- [illegible]

weight. A fuller discussion of weight control and the treatment of obesity is given in Chapter 21.

OTHER FACTORS AFFECTING TOTAL METABOLIC RATE

The ingestion of food increases metabolism. One research worker found that a fasting man had a metabolism averaging 9 per cent lower than that on the days when food was consumed However, metabolism goes on during fasting, showing that the body must continue burning fuel supplies even though the tissues are called upon to make up the deficit. This explains the loss of weight and wasting in severe illness and starvation

With prolonged fasting and subsequent loss of weight, the body tends to adjust itself by lowering the metabolic rate. This is comparable with setting back a thermostat so that the organism runs at a lower rate. This adjustment is true of adults, but children who are undernourished seem to have a higher rate, which makes undernutrition in children even more serious than in adults. So far there is no satisfactory explanation of this difference.

Specific Dynamic Action of Protein. Not all kinds of food are oxidized with an equal effect upon metabolism. Protein stimulates metabolism, so that a greater amount of heat is produced in its metabolism than in that of similar quantities of fats and carbohydrates This effect is commonly known as the specific dynamic action of protein Carbohydrates and fats have a much less *marked effect*, but the slight stimulation that results from the intake of food of any type accounts for the fact that metabolism tests usually are taken before breakfast when no food has been eaten

CHAPTER SIX

Minerals

MINERALS ESSENTIAL FOR LIFE

Minerals have been classed among the "little things" in nutrition, but they are far from little in importance Plant life, animals, bacteria and other one-celled organisms all require proper concentrations of certain minerals to make life possible Minerals serve as part of structural tissue or control certain vital functions. Changes of concentration which may seem small can be fatal Thus, common salt, which in dilute solution is necessary for most forms of animal life, becomes a preservative when foods are salted or kept in brine because the concentration kills bacteria. On the other hand, marine forms (fish and shellfish) quickly die when subjected to fresh water.

In natural foods, minerals are present in various forms mixed or combined with proteins, fats and carbohydrates. Processed or refined foods, such as fats, oils, sugar and cornstarch, contain almost no minerals The total mineral content of a food is determined by burning the organic or combustible part of a known amount of a food and weighing the resulting ash. The ash then is analyzed for individual mineral elements. Most foods have been analyzed for 10 or more mineral elements, but in dietary practice the figures most commonly used are those for calcium, phosphorus and iron and, for therapeutic purposes, sodium and potassium (Tables 1 and 5, Part Four).

Minerals such as iodine, fluorine and other trace elements which are essential for life may be found abundantly in drinking water in certain areas or in foods grown on soils in those areas, while in other parts of the country they are deficient in both soil and water. Still other mineral elements such as sodium, potassium, chlorine, sulfur and magnesium, all necessary in human nutrition, are so universally present in foods that we do not need to worry about deficiencies.

Accurate data on the mineral constituents of common foods no longer satisfy the scientific nutritionist. The question of relative availability of mineral elements in various forms for physiologic processes has stimulated new investigations in this field. In discussions of the subject written 40 or more years ago,

tribute largely calories to the diet Check your answer with the food composition tables in the back of the book

10. The basal metabolism of a man of average size is about 1,650 calories per day, of a woman of average size, about 1,350 calories If the measured basal metabolism for such a person were 12 per cent below average (−12), how many calories per day would each be expending under basal conditions?

11. When there are acute food shortages, should relief agencies supplying a minimum of food to relieve starvation think first of calories, protein or vitamins, and why?

See Bibliography in Part Four for other pertinent material on the topics discussed in this chapter.

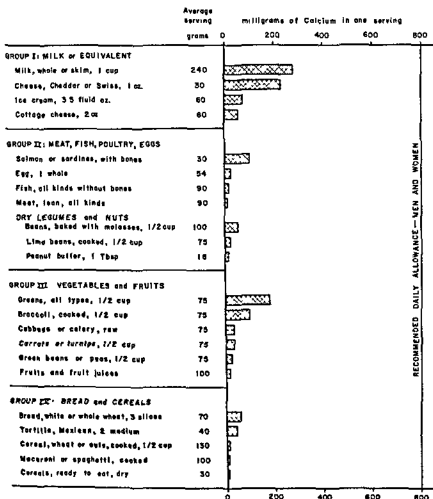


Figure 15

and phosphorus in the cooking of vegetables, especially if the cooking water is discarded There are wide differences in mineral content of plants grown on different soils Thus, foods should be chosen with a view to supplying an excess of these elements and providing a liberal margin of safety. This excess

the opinion prevailed that the organic forms of minerals found in plant and animal foods were better utilized than the inorganic. However, modern research has disproved this theory. Today we are aware that many minerals occur

the tissues, minerals may function as simple salts or be incorporated into organic complexes Sulfur and small amounts of other elements are incorporated in organic compounds which need digestion before they can be absorbed.

MINERAL COMPOSITION OF THE BODY

The organic constituents, carbohydrate, fat, protein and related substances, plus water make up about 96

mineral in some form, some as hard tissues such as bones and teeth, some as salts in the fluid of the body. The most important structural or functioning mineral elements in the human body are listed in the accompanying table

MINERAL COMPOSITION OF AN ADULT HUMAN BODY*

ELEMENT	PER CENT OF TOTAL ASH	GM./70 KG. MAN
Calcium (Ca)†	39	1,160
Phosphorus (P)†	22	670
Potassium (K)	5	150
Sulfur (S)	4	112
Chlorine (Cl)	3	85
Sodium (Na)	2	63
Magnesium (Mg)	0 7	21
Iron (Fe)	.15	4 5
Iodine (I)	0007	.02
Manganese (Mn), Copper (Cu), Cobalt (Co), Nickel (Ni), Fluorine (Fl), Zinc (Zn), Aluminum (Al), Arsenic (As), Bromine (Br), Silicon (Si) and Selenium (Se)	Traces	

* Shoul, A. T.: Mineral Metabolism, New York, Reinhold, 1939.

† Amounts of calcium and phosphorus are variable, according to the bone composition and the reserves of these elements in bone.

CALCIUM AND PHOSPHORUS

Calcium is the mineral most likely to be deficient in the average American diet Phosphorus also is found to be low in some cases.

Although calcium and phosphorus usually are associated because they function together in the body, they are not always found in the same foods.

Food Sources of Calcium and Phosphorus. It is apparent in Figure 15 that milk and milk products are the most important sources of calcium and in readily available form A few of the green, leafy vegetables used commonly in the Southern states are good sources

oxalate, thus rendering the calcium unavailable In most sections of the country greens are *not* used regularly enough or in sufficient quantity to be relied upon to replace milk, but they are important when milk is scarce or unobtainable. *Meats and poultry are* poor sources of calcium Cereal products contribute little, except where breads are enriched with calcium or are made with a high percentage of milk solids The pattern dietary of 1,300 calories provides almost the recommended allowance of 800 mg (0 8 Gm.), which will be supplemented by the calcium of the foods added to make up the needed calories (*see* Chap. 18).

Phosphorus is more widely distributed and less likely to be deficient in the average diet than calcium Poultry, fish, meats, cereals, nuts and legumes, as well as milk and milk products, are all good sources.

There may be slight losses of calcium

The calcium and phosphorus requirements for growth have been investigated in children of different ages, observing the level of intake at which maximum retention of calcium and phosphorus is attained. Growth of bone requires the

[illegible]

and until puberty, when there is a sharp *rise again during the period of rapid* growth The recommended allowances of calcium for children take into account the different ages and sex needs Cal-

[illegible]

in calcium and phosphorus is necessary to meet these needs. For infants, the intake requirements may well be stated in terms of the amount of milk, since this is the chief food source For older children, the requirements for calcium and phosphorus are most easily met by including a quart of milk a day or its equivalent in milk products The calcium and the phosphorus content of milk is not only high but in good proportion, and these factors are more readily available from milk than from

[illegible]

vitamin D can function only when calcium and phosphorus are present in reasonably adequate amounts Compare the story of vitamin D in Chapter 7.

IRON

Iron is another mineral that is apt to be low in certain types of American diets, although comparatively small amounts are needed There is less than 5 Gm. of iron in the body of a full-grown healthy person, but its importance to our well-being is strikingly out of proportion to the quantitative figures

Blood Building Iron is a necessary constituent of hemoglobin, the coloring matter of the red blood cells, and is an essential constituent of every cell in the body. As a constituent of hemoglobin it is vitally essential to the processes of nutrition. Hemoglobin is a compound of protein, iron and a pigment complex Hemoglobin combines with oxygen in the lung capillaries to form oxyhemoglobin and as such travels in the blood stream to the tissues, where the oxygen *is released to take part in oxidative* processes Part of the carbon dioxide formed is carried back by the same hemoglobin, which drops its load in the lungs and starts out with a new load of oxygen Therefore, it is highly important that the food contain sufficient amounts of iron along with other necessary elements needed for its utilization

The iron of our bodies is used very efficiently. Normally, it is not used up or destroyed when it becomes a con-

[illegible]

amounts of unabsorbed iron may be lost in the stools, very little is excreted in the urine Loss of blood due to hemorrhage, menstruation or accident is responsible for the major losses of iron from the body.

Food Sources. The best food sources of iron are found in the meat, fish, poultry and egg group. The green, leafy vegetables, dried fruits and enriched bread and cereal products are the best plant sources Milk and milk products are conspicuously low in iron Such foods as molasses and raisins, popularly featured as good sources of iron, are rich on a percentage basis, but small servings of these foods used infrequently *do not constitute as important a source*

[illegible]

day, together with other foods suitable for his age, provides such a margin of safety

Function. Ninety-nine per cent of the calcium in our bodies and a large

calcium phosphate is removed from

uble

the

edes

bone in the development of the fetus and the young animal, and normally the calcium phosphate is deposited in it as growth and strain demand. When nature's plan is thwarted by an inadequate supply of either of these minerals in food, or by an inability to utilize them, growth may be retarded, or, as more often happens, growth in size continues, but the new bone is abnormal in structure and poorly calcified. This results in the bowed legs, enlarged ankles and wrists, prolapsed thorax and other bone deformities characteristic of rickets.

Calcium and phosphorus perform other less conspicuous but necessary functions in the body, of which only a few can be mentioned here Calcium in the blood is necessary for the process of clotting. Blood calcium below normal gives rise to tetany, and the physician may prescribe calcium to be given intravenously in order to raise the blood level of calcium and stop the muscle twitching characteristic of tetany.

Phosphorus is a necessary constituent of every cell in the body and is especially important in nerve tissue. Radioactive phosphorus used as a "tagged" element in metabolic research has confirmed the wide diversity of function of phosphorus

Phosphates are now recognized as playing a major role in muscle physiology. A complex carbohydrate-phosphate compound is the storage battery which can release muscular energy immediately when a nerve impulse gives the order.

Phosphates also assist in maintaining the acid-base balance of the blood. Further consideration will be given to this function in the discussion of the acid-base equilibrium in the body.

Dietary Requirements. The dietary requirements of calcium and phosphorus for children and adults have been investigated extensively. Earlier work with animals led the way on how to attack the problems in humans.

The assumption that end products of metabolism appear in the urine and unabsorbed material in the feces does not hold for calcium and phosphorus. Some metabolized calcium and phosphorus may be excreted via the intestinal tract. Thus, the problem of balance studies to determine calcium and phosphorus requirements is complicated A person is said to be in equilibrium with respect to any nutrient if the intake approximately equals the output.

The maintenance requirement of calcium for adults has been studied in several laboratories, but it is difficult for workers to reach complete agreement. It is generally accepted that a recommended allowance should be about 50 per cent above a minimum figure to allow for stresses, strains and emergency needs, as well as for individual variation The Recommended Dietary Allowances, as revised in 1958, give 0 8 Gm. per day as adequate for adults, with 1.5 and 2 0 Gm. recommended during pregnancy and lactation The same allowance is recommended for women as for men, despite their smaller average size, in order to ensure ample stores in preparation for maternity

In the Recommended Allowance Table no figures are given for phosphorus because dietary deficiencies of phosphorus are uncommon when diets are adequate in calcium and protein. In general, the phosphorus allowance

CALCIUM AND IRON IN PATTERN DIETARY FOR 1 DAY

FOOD GROUP	AMOUNT IN GM	HOUSEHOLD MEASURE	CALORIES	CALCIUM MG.	IRON MG
Milk or equivalent	488	2 c (1 pint)	332	576	.4
Egg	54	1 medium	77	26	1 3
Meat, fish, poultry	90	3 ozs. cooked	257	9	2 9
Vegetables					
Potato, cooked	100	1 medium	83	11	.7
Green, leafy, yellow	75	½ c.	18	39	7
Other	75	½ c	39	15	6
Fruits					
Citrus	100	1 serving	41	20	.3
Other	100	1 serving	85	11	.8
Bread, white, enriched	70	3 slices	189	54	1 2
Cereal, whole grain or enriched	30	¾ c cooked or 1 oz dry	80	8	6
Butter or margarine	14	1 tablespoon	100	3	
			1,301	772	9.5

potato and enriched white bread, it may be helpful to remember that white foods are not good builders of red blood

It has been shown that there is a marked difference in the availability of iron derived from various food sources. For instance, only about half the iron in whole cereals is in usable form, and even less in certain green leaves. It is impossible to tabulate available iron in foods at present, but work in progress may throw further light on the subject The basic dietary of 1,300 calories provides 9 5 mg of iron. Additional foods to supply extra calories would easily [illegible]

S [illegible]

[illegible] have evolved over the years from extensive research From the maze of findings certain well-established facts have evolved.

The iron in foods may be in either organic or inorganic compounds, and its availability for human nutrition depends upon other factors than the form in which it occurs Iron absorption may be hindered by certain abnormal conditions in the alimentary canal, especially a lack of sufficient hydrochloric acid in the stomach. By the use of radioactive iron which can be followed as a tracer, it appears that iron is absorbed from the intestinal tract largely in response to need, and the rest is discarded

Following absorption, iron is transported to the liver for storage and can be utilized for hemoglobin synthesis [illegible]

[illegible] was the first proof of one inorganic element's functioning in the utilization of another. Copper is not present in the hemoglobin molecule Adequate protein must also be available for synthesis of the complex compound hemoglobin. Other dietary essentials, especially certain vitamins, seem to aid in this process, according to Leverton,[1] who demonstrated that young women could main-

[1] Leverton, R M, and Marsh, A. G: J Nutrition 23 229, 1942.

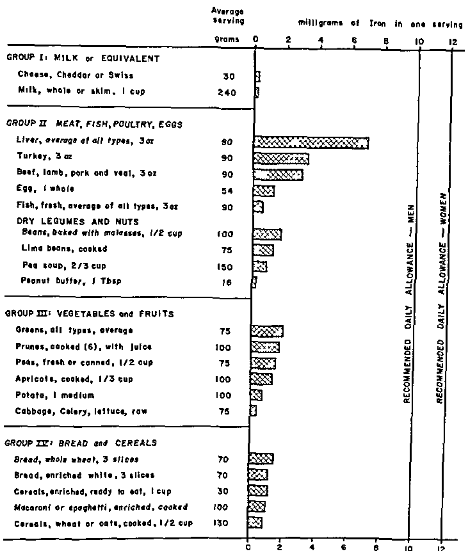


Figure 16

have a noticeable lack of pigment, which *is significant, since iron salts are all* colored and usually lend color to a food rich in this element. Compare, for instance, egg yolk with egg white, molasses with white sugar, *whole with* milled grains, and spinach with celery. With a few exceptions, such as the

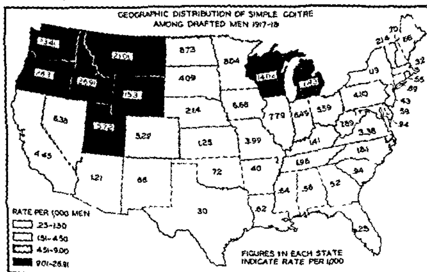


Fig 17. Geographic distribution of simple goiter among men drafted for World War I. These goitrous areas are naturally low in iodine. (U S Dept. Public Health)

over the United States, and that it seemed to be most prevalent in the very regions *where there was the least iodine* This early suspicion was confirmed, and we now recognize that common goiter is primarily an iodine-deficiency disease.

As an essential constituent of the thyroid gland in man and in animals, sufficient iodine must be supplied if that gland is to function normally. The amount of iodine present in the body of an adult is estimated to be about 25 mg, and most of it is concentrated in the thyroid The minute amounts found in most animal and plant tissue have made the detection and the measuring of this factor an extremely difficult technical problem. Refined methods of analysis have demonstrated that marine fish, shellfish and seaweed are relatively high in iodine. In general, water supplies and vegetables grown in nongoitrous regions are richer in iodine than the water and the vegetables in goitrous regions

Iodine deficiency is characteristic of the soil of the Great Lakes region and as far south as West Virginia and of *some sections of the Pacific Northwest*, and the incidence of goiter is highest in these regions Outside the United States goiter is common in Switzerland and in mountainous regions of South America and New Zealand In south central Brazil there are areas where enlarged thyroid among schoolchildren is so common that a child without such enlargement is the exception and is ridiculed by other children as a "bottle-neck"

The thyroid gland becomes enlarged owing to the overgrowth of the structural tissue, but there is a decrease in the actively secreting tissue, and the whole organism suffers from the lack of this internal secretion The incidence of common goiter is higher in females than in males and is most apt to appear during *adolescence or pregnancy*.

Goiter Prophylaxis. The suggestion was made by Marine and Kimball that iodine might be administered to children

tain their hemoglobin level on less iron if all other essentials were present in the diet Apparently iron is a mineral element which is rigidly conserved by the body and used repeatedly If no blood is lost, there is little need for new iron except for the growth of a new organism.

Dietary Requirements. ADULTS The recommended allowance for women is 12 mg of iron per day, with 15 mg per day during pregnancy and lactation.

The 10 mg. of iron per day recommended for men may be more liberal than is necessary, because there is evidence that the male adult needs relatively little iron. Usually, this need is met if the diet is adequate in other respects This figure has been retained, however, until more data on the subject are available, because this level can be attained without difficulty, and a generous intake may be desirable for other reasons

vision for new material as well as replacement requires a more liberal supply of iron. The anemias of infancy and childhood are evidence of the shortage that frequently occurs, although nature seems to have made provision for the period of nursing Milk is essentially low in iron, but a reserve of this mineral stored in the liver of the infant during prenatal life is drawn upon during the nursing period and economically conserved for repeated utilization The potential shortage of iron that may occur by the sixth or the seventh month may be forestalled by the early use of egg

culated for each age group on basis of body weight.

needs are greater than those of the

blood-building elements. Chlorosis or adolescent anemia in girls may be due to a low reserve of iron, or of other factors necessary for blood building, when menstruation begins Languor and exhaustion result from the lack of an

important constituent—iron Boys are growing rapidly at this age and also need iron for hemoglobin building, but

IODINE

Common goiter has been known since prehistoric times, but it was not recognized as a deficiency disease until the late 19th century. Baumann discovered iodine in the thyroid gland in 1895, and from then on iodine was used more or less as a preventive or curative treatment for endemic goiter. Before that time burnt sponge (a good source of iodine) had been a popular folk remedy for goiter.

Not until 20 years after Baumann's discovery was serious attention given to iodine as prophylaxis against goiter in large population groups. No doubt, action was stimulated by the high incidence of goiter among draftees from certain states during World War I. The map (Fig 17) shows the distribution of goiter, which corresponds in large measure to the areas where iodine is deficient in the surface soil and the drinking water

Iodine and Goiter. Before surveys were made of the iodine content of soil, it had been noted that the disease of common goiter was unevenly distributed

[2] Johnston, F. A J. Am. Dietet. A. 29 758, 1953.

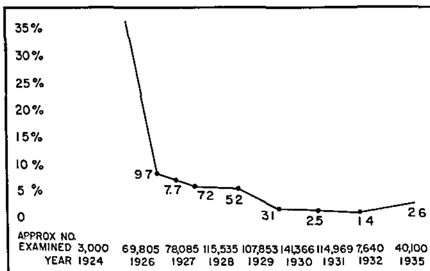


Fig 18. Graph illustrating the incidence of goiter in the public schools of Detroit from 1924 to 1935 (Kimball, O. P. J.A.M.A. *108* 860)

active elements. These are known as trace elements because they are found only in such minute quantities. However, this does not mean that they are unimportant, for it is now known that some of them are absolutely essential, usually in some enzyme system, while the functions of others are not so well understood. Some of the more important trace elements, such as copper and iodine, have already been discussed.

Essential Trace Elements. The trace elements cobalt, fluorine, manganese and zinc are recognized as essential to animal health.[4] Copper and iodine may also be considered in this class.

Cobalt is a component of vitamin B_{12}, a nutritional factor necessary for the formation of red blood cells. An overdose of cobalt given to animals experimentally has been shown to produce polycythemia, i.e., red cells in excess of normal. There is ample cobalt present in the average diet, and there is no danger of an excess from natural foods.

Fluorine has long been recognized as a normal constituent of bones and teeth, the dental enamel being especially rich in this element. The fluorine content of surface soils and water supplies varies widely and naturally influences the fluorine content of food grown in the region and, in turn, the level of human consumption.

Excess fluorine is now recognized as the cause of mottled enamel in the permanent teeth of children in certain areas of the world. This condition is endemic in limited areas—i.e., in the Texas Panhandle and adjacent areas—and is commonly known as dental fluorosis. The mottling occurs when fluorine is present in the drinking water in concentrations of 1.5 ppm (parts per million) or more. In these same areas the low incidence of dental caries attracted comment. Subsequently, the relation of traces of fluorine in local water supplies to the low incidence of dental

[4] Shohl, A. T. *Op. cit.*

in goitrous regions as a preventive measure. Consequently, as an experiment, iodine was administered to schoolchildren in Akron, Ohio, with remarkably successful results By a similar project, in three cantons in Switzerland the incidence of goiter was diminished during 3 years from 87 to 13 per cent. These demonstrations suffice to show that although the body requirements for iodine are exceedingly small, they must be met in order to prevent goiter Many sections of the country, notably the east coast and the Southern states, as well as California on the west coast, need pay little attention to this factor because iodine is indigenous However, in the [illegible]

foods are imported from many different localities, goiter may be less of a problem than in rural goitrous areas where mostly home-grown food is consumed.

Administration of iodine as a prophylactic measure against goiter had to be planned as a public-health activity so that it would reach all people in an area in safe but significant amounts The use of tablets either at home or in school was impractical, and the adding of iodine to drinking water was too expensive. Common salt is used by nearly everyone in somewhat comparable amounts. Therefore, a small percentage of an iodine compound was added to table salt to be marketed in goitrous regions, and an educational campaign was conducted to inform people why they should buy and use iodized salt.

This plan was adopted by Michigan [illegible]

Eleven years later the results of this plan adopted by the Michigan Department of Health far exceeded the hopes of those who instigated it. The incidence of endemic goiter or enlarged thyroid has been reduced almost to nil.[3] The decrease in the sale of iodized salt that has occurred since publicity on the subject has fallen off is paralleled by a slight increase in the number of goiters in schoolchildren The discontinuance of iodized salt in one county in Michigan was followed by a marked rise in the incidence of goiter within 3 years The incidence of goiter in the public schools of Detroit from 1924 to 1935 is a striking illustration of what health education can accomplish (Fig. 18). In other states, where the use of iodized salt was not encouraged, the incidence of thyroid enlargement has remained fairly constant over the same period of years.

In 1941, the National Study Committee on Endemic Goiter resolved that the content of potassium iodide in table salt and in salt for domestic animals should be 0 01 per cent, provided that a suitable stabilizer was used. This amount was calculated from per-capita consumption of salt to be sufficient for the prevention of endemic goiter and not great enough to cause harmful effects in other types of thyroid disorders. Iodized salt has since been continuously available in groceries in parts of the country where it is needed and at no increased cost to the consumer Education is still necessary, however, if all people are to understand why it is desirable to choose iodized salt when shopping. Iodized salt is now being introduced into other countries where common goiter is endemic, probably as a result of its successful use in this country.

TRACE ELEMENTS

Many inorganic elements in addition to iodine occur in animal tissues in extremely small quantities and in some instances are detected only by spectrographic methods or by the use of radio-

[3] McClure, R D: JAMA 109.783, 1937.

dehydration and possibly to salt depletion, accompanied by heat cramps Some industrial plants provide for all employees water with about 0 1 per cent solution of salt or "salt tablets" to be taken with a liberal amount of water The significance of the salt as a stimulant to thirst, thus preventing dehydration, may be even greater than the role of salt *per se* In any case, reduction of "heat fatigue" is reported as a result of more salt and water

Sodium, potassium and magnesium salts in solution in the blood and the lymph are chiefly responsible for maintaining the osmotic pressure relation between cells and the surrounding fluids. The nice balance that is ordinarily maintained in the body may be disturbed locally when bathing in fresh water, as shown by the irritating effects on the delicate nasal membranes However, a salt solution of a concentration similar to that of our tissue fluids is not irritating Such a solution of 0 85 per cent sodium chloride in distilled water is known as physiologic saline. It is useful for gargles, washes or enemas, and is the basis for some intravenous solutions Sodium and potassium also play an extremely important role in the maintenance of neutrality in the body tissues, as discussed later in this chapter

Magnesium is relatively abundant in

enzymes It forms an integral part of the complex bone salts It is closely related to calcium in its functioning, but it cannot replace it in the tissues. The interrelationships of calcium, phosphorus and magnesium are complex, and a disturbance in the normal balance may result from or cause pathologic conditions

Sulfur is more concentrated in hair, nails and bone matrix than in other tissues. It is an important constituent of all soft tissues and of certain substances such as glutathione and insulin Sulfur is a component of the amino acids cystine and methionine and, as such, is found in most protein foods It is found also in two of the B vitamins Thus, sulfur usually is adequate if the diet is well balanced and supplied with adequate protein.

ACID-BASE BALANCE

The maintenance of a constant acid-base balance in the blood and the tissues is a function of normal metabolism The reaction of the blood is slightly alkaline (*p*H 7 3-7 45), varying only within narrow limits, regardless of the amount of acid products formed in metabolism This equilibrium is maintained by a series of buffers in the blood and the tissue fluids Buffers are able to react with either acids or bases without causing much change in the reaction of the solution

Proteins of the blood (hemoglobin and plasma proteins) and the phosphates, the carbonates and the organic acids, all in solution in the blood, play an important role in the maintenance of this balance Acid products formed in metabolism are disposed of either through the lungs or the kidneys Thus carbon dioxide can be exhaled, while sulfates, chlorides and several organic acids are neutralized by the buffers and eliminated in the urine. The mechanism tends continually to deplete the alkaline elements of the blood and the tissues, but the minerals in our food replenish the supply

When the supply of buffer substances becomes depleted due to starvation or inability to metabolize food properly, a condition of acidosis may result. Actually, the blood does not become acid, but the term *acidosis* is used to indicate a lowered alkaline reserve which results when the basic elements are used up faster than they are replenished. This may happen in severe diabetes, when the organic acids from faulty metabolism accumulate.

Alkalosis is the opposite of acidosis.

caries has been studied extensively.[5,6] [illegible] enough to reduce the incidence of dental caries, had to be answered. It is now *estimated that 1 ppm. is about the* critical level, and if this amount is added to the water in a community, a reduction of 50 to 60 per cent in dental caries may be anticipated Large-scale experiments now in progress in several communities point the way to effective use of fluorine prophylaxis. Mass control of dental caries in children is indeed a possibility in the future (*See* further discussion of this subject in Chap 20)

Manganese plays essential roles both in plant and in animal metabolism. It occurs in all human tissues but seems to function specifically in blood formation and in certain endocrine glands. The manganese requirement of man is not known, but the average diet probably supplies enough. Blueberries and wheat bran are the richest known sources, nuts come next The manganese content of plants is dependent upon soil content.

Zinc occurs in animal and plant tissues in amounts comparable with those of iron It is present in the human body as a constituent of a metabolic enzyme. It is considered to be essential, but no quantitative estimates of requirements have been made.

Trace Elements of Doubtful Significance. No one has yet been able to demonstrate that aluminum, arsenic, bromine, nickel and silicon are essential to animal life. However, all are found in traces, both in animal and in plant tissues. They appear to be harmless in the amounts and the forms found in natural foods

Contrary to an earlier popular misconception, traces of aluminum from cooking utensils or in baking powders are harmless

Arsenic is found in sea foods and in the human body It accumulates in hair and in nails, but its biologic function is not understood It has been used therapeutically since the Middle Ages. Overdoses cause gastro-intestinal disturbances, *but there is no danger of an excess* from natural foods

Toxic Trace Elements. Selenium and fluorine (the latter discussed previously) are the only mineral elements commonly found in food or drinking water in concentrations detrimental to human or animal health In certain areas in the western part of the United States selenium occurs in locally grown feeds in sufficient concentrations to cause an animal disease called blind staggers It was formerly known as alkali disease, but it is now recognized as due to an excess of selenium. So far as has been reported, this mineral is not a menace to human health

SODIUM, POTASSIUM, MAGNESIUM, SULFUR AND CHLORINE

Of the body minerals mentioned, sodium, potassium, magnesium, sulfur and chlorine usually are present in abundance in the average diet and do not need further discussion from that particular point of view

Sodium chloride, common table salt, plays a regulatory role in the body metabolism, both the sodium and the chlorine performing specific functions. Animal foods probably contain enough sodium chloride for our actual needs, but with plant foods we seem to need or want a moderate amount of sodium chloride, as do the herbivorous animals, who are known to seek the "salt licks" This craving may be due to the large amount of potassium that is present in plant tissue which needs sodium to balance it in the functioning of animal cells. In certain pathologic states this need is exaggerated. When hard work is performed in a high-temperature environment, excessive perspiration may lead to

[5] McClure, F J J A M A 139:711, 1949
[6] Ast, D B, *et al.* J. Am Dent A 52 291, 296, 307, 1956

dehydration and possibly to salt depletion, accompanied by heat cramps Some industrial plants provide for all employees water with about 0 1 per cent solution of salt or "salt tablets" to be taken with a liberal amount of water. The significance of the salt as a stimulant to thirst, thus preventing dehydration, may be even greater than the role of salt *per se* In any case, reduction of "heat fatigue" is reported as a result of more salt and water.

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Magnesium is relatively abundant in muscle and in bone tissue It probably acts with other minerals as a regulator and as a constituent of certain tissue enzymes It forms an integral part of the complex bone salts It is closely related to calcium in its functioning, but it cannot replace it in the tissues. The interrelationships of calcium, phosphorus and magnesium are complex, and a disturbance in the normal balance may result from or cause pathologic conditions.

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Alkalosis is the opposite of acidosis

This may occur when severe vomiting over a period of time causes a great loss of hydrochloric acid. The body quickly adjusts when the acute condition is relieved.

The reaction of the urine may vary widely in a normal individual because the amount of acid or basic end products from metabolism will vary and the excess must be eliminated.

ACID-BASE REACTION OF FOODS

Conclusive evidence is not as yet available regarding the practical importance of the acid-base balance of foods in relation to health. Experience and scientific evidence indicate a wide range of adaptability on the part of the human body and do not support the "scare" propaganda with which certain food faddists promote the sale of "alkalizing" compounds to prevent acidosis.

The usual mixed diet contains a good balance of acid and basic factors. The basic elements sodium, potassium, magnesium and calcium may occur as salts of inorganic acids, such as phosphates, sulfates, chlorides or organic acids. The mineral elements are sometimes referred to as "ash" because they do not "burn" up. When foods are metabolized in the body, the mineral elements are released to function in maintaining the acid-base balance, the organic acids are mostly oxidized to carbon dioxide and water. Foods are said to be acid or basic according to whether the acid or the basic elements in the ash predominate. Most fruits contain organic acids combined with basic inorganic elements. When such compounds are oxidized in the body, they leave an alkaline ash. Some other foods, such as cereals and meats, not at all acid in taste, yield end products that are strongly acid. Thus by potential acidity or alkalinity of foods is meant the reaction that they will ultimately yield after being oxidized in the body.

Some workers have attempted to establish quantitative figures for the excess of acid or basic elements in foods, but the significance of these figures now is questioned, therefore, they have been omitted. A simple classification easy to remember and sufficient for general use is as follows.

Acid-Base Reaction of Foods

Potentially Acid or Acid Ash Foods
Breads—all types
Cakes and cookies, plain
Cereals and crackers
Cheese—all types
Eggs
Fish and shellfish
Fruits—cranberries, plums and prunes
Macaroni, spaghetti, noodles
Meats and poultry
Nuts—Brazil, filberts, peanuts, walnuts
Vegetables—corn and lentils
Potentially Basic or Alkaline Ash Foods
Fruits—all types (except cranberries, plums and prunes*)
Jams and jellies, honey
Milk, cream and buttermilk†
Molasses
Nuts—almonds, coconut, chestnuts
Vegetables—all types (except corn and lentils)
Neutral Foods
Butter or margarine
Candy, plain
Cooking fats and oils
Syrups
Starches, corn and arrowroot
Sugars

* Ash alkaline in vitro, partly acid in vivo, because organic acids are not completely utilized.

† Calcium largely excreted into intestinal tract; therefore, effect upon pH of serum tends to be acid because of high phosphate content.

SUMMARY OF MINERAL ELEMENTS IN NUTRITION

(*The information summarized here is given in more detail in the text.*)

ELEMENT	RICH SOURCES	DIETARY ALLOWANCE FOR ADULTS	FUNCTION IN THE BODY	ELIMINATION
Calcium	Milk, cheese, some green vegetables, *molasses*	Adult, 0.8 Gm. daily; child, 1.0 Gm. Low in average diet	Bone and tooth formation, coagulation of blood. Regulates heartbeat, aids in regulating mineral metabolism	Feces chiefly, some in urine
Phosphorus	Milk, poultry, fish, meats, cheese, nuts, cereals, legumes	1.5 Gm. daily. Usually adequate in average diet	Bone and tooth formation, constituent of cells. Aids in utilization of organic foodstuffs and regulation of neutrality	Urine and feces
Iron	Liver, meat, legumes, whole or enriched grains, green vegetables, dried fruits	women, 12 mg.; men, 10 mg. daily. More for anemic individuals	Constituent of hemoglobin, blood and tissue cells. Necessary for oxygen-carrying power	Feces (mostly unabsorbed iron)
Iodine	*Sea foods,* water and plant life in nongoitrous regions; sodium iodide in iodized salt	Adequate in nongoitrous regions, adult, 0.15–0.30 mg.	Necessary for normal functioning of the thyroid gland	Urine
Sodium	Common salt, sea foods, animal products	Adult, about 3–6 Gm. Adequate in average diet	Regulates osmotic pressure, neutrality and heartbeat	Urine chiefly and perspiration
Potassium	*Cereals, vegetables, legumes,* meats	Adult, 2–4 Gm. Adequate in average diet	Constituents of all cells. Regulates osmotic pressure and neutrality	Urine chiefly and perspiration
Magnesium	Nuts, cereals, legumes	Adequate in average diet	Necessary for mineral balance in body	Feces chiefly, some in urine
Chlorine	Common salt, sea foods, animal products	Adequate in average diet	Constituent of acid in the gastric *juice.* Regulates osmotic pressure	Urine chiefly and perspiration
Sulfur	Protein foods	Adequate if protein is adequate	Necessary constituent of all body tissues—hair and nails especially	Urine
Copper	Liver, nuts, legumes, cereals, dried fruits	Adult, about 1.0–2.0 mg. Adequate in average diet	Aids in utilization of iron in hemoglobin synthesis	Feces chiefly

STUDY QUESTIONS

1. Why are minerals essential to life? Name at least 3 functions of minerals in the body

2. What happens in growth if calcium and phosphorus are inadequate in the dietary? Why are these 2 minerals usually discussed together?

3. Milk is the single best source of calcium in the diet. See if you can write a diet which meets the calcium require-

4 What situation results when the iron intake of the diet is low? Name 4 good food sources of iron other than liver.

5 Give the reasons underlying the supposition that adult men may need very little, if any, iron in their intake. Why will adult women continue to need small amounts?

6 Why is iodine such an essential constituent of the body? What is the situation in states lacking iodine in the soil and the drinking water? What is being done to overcome this shortage? Are there any common food sources of iodine?

7. Compare the calcium and iron supplied by the 1,300 calorie basic dietary with the recommended allowances for these minerals.

8. Name some of the minerals having important roles in the body, although they occur there in relatively small quantities What are some of their functions? Do they appear in food in sufficient quantities to meet physiologic needs?

9. What is meant by the term *trace elements?* Name one of them now under investigation in the prevention of dental caries. What are the findings about this element?

10 What is meant by acid or basic ash when referring to foods? Would a lunch of a meat sandwich, stewed prunes and coffee be predominantly acid or basic? Would this be detrimental to a normal person?

11. Are the blood and the tissues basic or acid in their reactions? How would you answer someone who said that she could not eat tomatoes "because they made her blood acid"? How does the body maintain its acid-base balance?

See Bibliography in Part Four for other pertinent material on the topics discussed in this chapter.

General Discussion (all vitamins)
Vitamin A and Precursors
Vitamin D (Calciferol)
Vitamin E (Tocopherol)
Vitamin K

CHAPTER SEVEN

Fat-Soluble Vitamins

GENERAL DISCUSSION (ALL VITAMINS)

The stories of the early recognition of deficiency diseases and the discovery of the vitamins are most entertaining and worthy of popular dramatization But the interest in vitamins must not overshadow the importance of the other nutritional factors—proteins, fats, carbohydrates and minerals Actually, the vitamins function to make possible the more efficient utilization of these other food constituents

Chapters 7 and 8 are brief résumés of accepted facts or theories regarding the function of each vitamin in normal nutrition, its properties, assay methods and distribution in common foods and food concentrates Nutritional deficiencies, their symptoms and dietary treatment are discussed in Chapter 20.

Definition. Vitamins are potent organic compounds which occur in minute quantities in natural foodstuffs, they perform specific and vital functions in the cells and the tissues of the body This definition might also apply to essential amino acids or other organic compounds present in small amounts and necessary for the functioning of living tissues The term *vitamin* is applied to a limited number of these compounds not otherwise classified There is really little justification for these constituents of foods bearing the common name vitamins—they differ from each other in physiologic function, in chemical structure and in natural distribution —but apparently the term *vitamin* is here to stay

History. A few early physicians ... the connection between food [illegible] century and scurvy in the 16th, but it was centuries later that certain foods were recommended as protective The first vitamins were discovered as "accessory factors" in foods which had proved to be curative for specific deficiency diseases In other words, vitamins were first recognized by their absence rather than by their presence

In the early years of the 20th century workers in Germany, the Netherlands, Great Britain and the United States were beginning to use animals for nutrition experiments A number of investigators showed that purified rations containing only protein, fat, carbohydrate and minerals would not support growth. They observed that natural foods provided some substances other than the basal constituents which were essential

for normal growth and well-being These workers initiated the search for "accessory food factors," later called vitamins Since then our knowledge of vitamins has grown rapidly.

Nomenclature. The term *vitamine*, meaning a vital amine, was proposed by Funk in 1911 to designate a new food constituent necessary for life which he thought he had identified chemically. Other terminology was proposed as new factors were discovered, but the word *vitamin*, with the final "e" dropped to avoid any chemical significance, met with popular favor.

At first the individual vitamins were named by letter or according to their curative or preventive properties, but present opinion favors names descriptive of the substance As the chemical structure of each vitamin is discovered, it is named appropriately, if it is not already a recognized compound. However, the lettered nomenclature may still be used to some extent, especially in popular discussions of the subject. *From time to time new vitamins are* postulated and are added to the accepted list after extensive research

Whenever a supposedly single vitamin proves to have more than one [illegible]

Sometimes it is convenient to group the vitamins according to solubility Vitamins A, D, E and K are fat soluble Two water-soluble groups are recognized—those having vitamin C activity and the large group known as the [illegible]

[illegible]

the only device for testing foods for *their* vitamin content This type of procedure, called the bio-assay method, is still the basis of comparison for the standardization of newer chemical or microbiologic methods of assay. As the efforts of chemists to concentrate, identify and synthesize each vitamin have succeeded, potency then has been expressed in metric weights of pure crystalline substances.

The only vitamin values still given in International Units (I.U) as originally defined by a League of Nations committee are vitamins A and D. All others are given in milligrams (mg.) or micrograms (mcg.), whichever is appropriate.

Determination of the specific vitamin activity of natural foods becomes an increasingly difficult task as the number and the complexity of the vitamins increase. Table 1, Part Four, gives figures for 5 vitamins in foods. Vitamin losses in the cooking and the storage of food will be mentioned more specifically under each vitamin, but, in general, certain principles of vitamin conservation are worth noting Fat-soluble vitamins (A, D, E, K) are not lost easily by ordinary cooking methods, and they do not dissolve out in the cooking water. *Water-soluble vitamins (B complex and* C) are dissolved easily in cooking water, and a portion of the vitamins actually [illegible]

[illegible] age of vegetables tend to parallel the degree of wilting, such losses are progressive in the long storage of fruits and vegetables

Human Requirements. A natural sequence to more reliable figures for vitamins in foods has been the attempt to give quantitative estimates of human vitamin requirements. Obviously, these estimates are only approximate, based as they are upon the work of various investigators using different methods of approach Furthermore, there may be [illegible]

understanding what happens when there is a deficiency. With an understanding of the specificity or function of each vitamin there comes a better realization of their importance

Recommended dietary allowances of vitamins and other food essentials for different age and sex categories have been established by the Food and Nutrition Board of the National Research Council These levels, which may be attained by a variety of dietary patterns, makes for a wider application of nutri-

Terminology. Before discussing the individual vitamins there are terms that may need explanation The word *avitaminosis* means literally without vitamins, but it is generally used with a letter following (i e., avitaminosis A) to indicate a specific and a complete deficiency of that factor The word *deficiency* may be used to indicate varying degrees of shortage, thus, mild, moderate, severe or complete The possibility of an excess intake of certain vitamins has been postulated, and in one instance (vitamin D) a large excess has proved harmful Such a condition is termed *hypervitaminosis* Early symptoms of vitamin deficiencies so vague that they are rarely mentioned to a physician are called subclinical Recent attempts have been made to develop satisfactory criteria for judging early deficiencies These are discussed and listed in Chapter 20

The 4 fat-soluble vitamins A, D, E and K have nothing in common as to function or chemical structure, but they are all soluble in fat and fat solvents Absorption from the intestinal tract follows the same path as the fats, thus, any condition which interferes with fat absorption may result in poor absorption of these vitamins. They can all be stored in the body to some extent, mostly in the liver, and as a consequence of storage it follows that deficiencies are apt to be slower in manifestation than for most of the water-soluble group In several instances vitamin activity is not confined to a single substance, but several related substances produce a similar effect on the body Some of these fat-soluble vitamins are formed from precursors or provitamins.

VITAMIN A AND PRECURSORS

Physiologic Significance Vitamin A was the first of the fat-soluble vitamins to be recognized This happened in 1913 when two groups of workers, McCollum and Davis, at Johns Hopkins, and Osborne and Mendel, at Yale, demonstrated independently that rats failed to grow normally on diets lacking in natural fats At about the time growth ceased the eyes became inflamed and apparently infected This characteristic eye disease, known as xerophthalmia, was relieved in a few days by the addition to the diet of a little butter fat or cod-liver oil These fats contained the protective or curative factor later known as vitamin A

Vitamin A is a constituent of the visual purple in the retina of the eye, a substance necessary for normal vision The visual purple is rapidly decomposed in bright light and is restored in dull light. When supplies of vitamin A are adequate, this adjustment takes place rapidly. When vitamin A is deficient, the adjustment to dull light is slower

One of the earliest signs of vitamin A deficiency in man is a disturbance in

duly conscious of the glare of headlights in night driving. Night blindness or glare blindness may be evidence of the

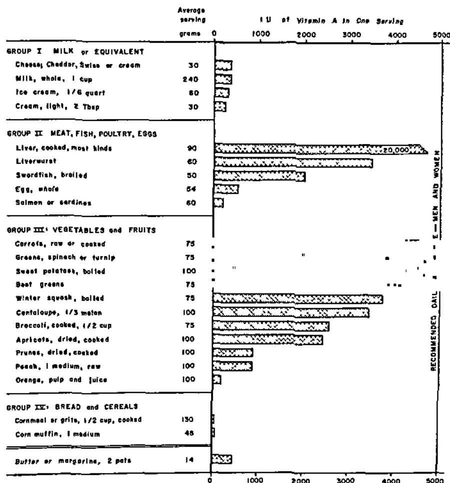


Figure 19

inability of the visual purple in the eye to adapt itself readily to changes in light intensity

The eye is not the only organ affected by vitamin A deficiency The mucous membranes lining the nose, the throat and other air passages, the alimentary canal and the genito-urinary tracts show changes in the epithelial cells known as keratinization. Rough, dry and scaly skin, especially on the arms and the thighs, is another indication of a vitamin A deficiency. Any of these symptoms may be due to an inability to metabolize carotene, i e , convert it into true vitamin A, even though the carotene intake is adequate

Wherever these tissue changes occur,

the natural mechanism for protection against bacteria or other foreign substances is impaired, and the tissue may easily become infected. Young rats show a high susceptibility to eye infections, older rats more often develop lung or glandular infections. Clinical observations show that normal mucous membranes lining nose, throat, sinuses and ear passages are the best defense against infections and that adequate vitamin A is an important factor in maintaining the normal functions of these membranes From these findings came the term *anti-infective*. This was not entirely justified, because the function of this vitamin is really the maintenance of normal epithelial cells that naturally afford the best physiologic protection against bacterial invasion

Vitamin A is essential to normal reproduction in rats, pigs and other animals Studies have shown that for successful reproduction and lactation the diet must furnish more vitamin A than is needed for good growth Female rats on minimal supply of vitamin A intake may show no outward signs of vitamin A deficiency yet they are not able to bear or rear vigorous young. [illegible]

adequate vitamin A may give birth to litters of pigs with defective eyes or without eyeballs This finding was one of the first evidences that prenatal malnutrition might cause abnormalities in the fetus.

Storage. Closely related to physiologic function is the body's ability to store vitamin A It is estimated that the liver may contain as high as 95 per cent of the vitamin A of the entire body, with small amounts in adipose tissue, lungs and kidneys Infants and young animals probably have low reserves of vitamin A at birth, but if they are well fed they store it rapidly. The liver gradually acquires, over a period of years, an increasing reserve of vitamin A which normally reaches its peak in adult life. The advantage of this reserve is chiefly to take care of temporary shortages or increased requirements Obviously, an intake above minimum requirement must be maintained most of the time if such a reserve is to be built up. Reserve stores of vitamin A are evident even in young animals. It requires from 5 to 6 weeks to deplete young rats in preparation for conducting bio-assays

Properties of Vitamin A and Its Precursors. For years vitamin A was associated with a yellow color in plants but did not seem to parallel the pigment in animal foods This observation was puzzling until the existence of a provitamin A—the yellow pigment carotene—was established as responsible for the vitamin A activity of plants. The true vitamin usually found in animal tissues is only slightly pigmented. It is recognized today that there are 4 forms of carotene that possess vitamin A activity Betacarotene is the most abundant and possesses about double the vitamin A activity of any of the other forms The animal body is capable of transforming these precursors into true vitamin A. This takes place in the liver and possibly in the intestines. Some animal products such as cream and butter may contain both forms, because some of the provitamin may remain unchanged.

Measurement of Vitamin A Value. The International Unit (I.U), which is the same as the U S P unit, is defined as the activity of 0 6 mcg (or 0 0006 mg) of betacarotene The new crystalline vitamin A has a potency of 4,500,-000 I U. per gram Fish-liver oils and commercial vitamin A concentrates are usually labeled in terms of I U per gram or per capsule Vitamin A content of common foods usually is given in I.U per 100 Gm (Table 1, Part Four).

Human Requirements. The estimation of adult minimum requirements usually is based on the daily intake of vitamin A necessary to maintain normal

dark adaptation The recommended allowance of 5,000 I U. daily for the average adult is approximately double the minimum requirement thus determined

Infants seem to require more vitamin A to maintain a normal blood level than to prevent impaired dark adaptation. Whichever is the true measure of need, established practices of infant feeding usually ensure an adequate intake. No direct measurements of vitamin A requirements during pregnancy and lactation have been recorded, but by analogy from animal experiments the recommended allowance of 6,000 I U during pregnancy and 8,000 I U during lactation have been agreed upon as safe. (For complete table of vitamin A allowances for all age and sex categories *see* Chap. 10.)

Food Sources. Fish-liver oils are the richest natural sources of vitamin A However, they usually are classed as food supplements rather than as foods. They vary according to species and season when caught, but commercial brands are well standardized for our convenience.

All animal livers are good sources of vitamin A, but they are not as rich as fish liver All milk products that include milk fat, such as butter, cream or full cream cheese, are rich in vitamin A. The milk of cows on green pasture is usually higher in vitamin A than is the milk of stall-fed animals, but the color is not an index of vitamin A potency

Carotene is abundant in carrots, from which it derives its name, but it is also present in even higher concentration in certain green, leafy vegetables and [illegible]

Animal foods that contain mostly preformed vitamin A seem to be more efficient sources of this factor for humans than the precursors found in plants However, the ample supply of carotenes in plant foods may well contribute a large share of the vitamin A requirement for adults who have a normal capacity for converting carotene into vitamin A. The form of carotene found in certain yellow vegetables may not be as available as carotene from other plant sources Figure 19 shows the relative vitamin A values of some common foods in 4 food groups. The true vitamin A of animal products in the first 2 groups is of greater physiologic value than the more abundant carotenes from the vegetables and the fruits of Group 3.

Stability in Foods. Vitamin A is gradually destroyed by heating in contact with air. This seems to be a process of oxidation accelerated by high temperatures However, a long period of heating at low temperature seems to be more destructive than a short period at a slightly higher temperature. Thus, milk boiled quickly or pasteurized by up-to-date methods still retains a large proportion of the vitamin A originally present Improved methods of evaporating and drying milk also limit the period of heating to a minimum so that very little vitamin A is lost. Open-kettle cooking of vegetables is more destructive to this vitamin than commercial or home-canning processes, where the product is heated in closed cans. Carotene is fairly stable in the ordinary cooking of vegetables but is decreased by wilting or drying before cooking. Cool, moist storage helps to prevent the loss Rancidity in fats destroys vitamin A.

VITAMIN D (CALCIFEROL)

History. Rickets has been known as a deficiency disease of infants for several centuries Renaissance painters often depicted children with rachitic deformities, probably such signs were so common as to be considered normal. The history of rickets as a deficiency disease is much older than our knowledge of how to prevent it. In the early 19th century cod-liver oil was a well-known folk remedy for rickets in Holland Some-

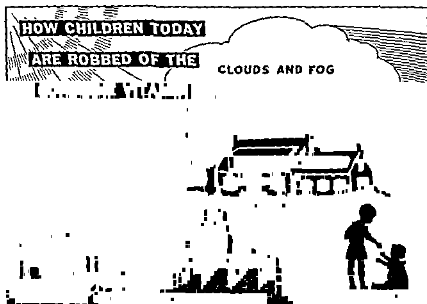


Fig 20 Why we cannot get enough sunshine (Wisconsin Alumni Research Foundation)

what later it was accepted as a therapeutic agent for rickets by physicians in Holland, France and Germany During the latter part of the 19th century cod-liver oil lost favor with the medical profession because physicians could not explain its action It was not used extensively then for many years until the period of World War I, when active research on the prevention and the treat- [illegible]

unknown factor was credited with some control over the metabolism of calcium and phosphorus

Physiologic Significance Present-day concepts of the function of vitamin D are based upon extensive research on [illegible]

vitamin C is for scurvy The absence of vitamin D alone probably will not cause rickets, unless the proportion or the total amounts of calcium and phosphorus in the diet are inadequate. However, when the latter condition exists, vitamin D controls the metabolism of the bone-building elements so as to make possible their most efficient utilization.

The low incidence of rickets in tropical climates suggested that sunshine might play a role in the prevention of rickets Even after it had been demonstrated conclusively that it was the ultraviolet light from sunshine that aided in the healing of rickets, it was difficult to understand the connection between this light effect and vitamin D from some food sources such as cod-liver oil. Eventually, the puzzle was solved when it was discovered that vitamin D activity could be produced in certain foods by irradiation with ultraviolet light. The oily secretion of the skin is also activated

when exposed to sunlight, and by reabsorption protects the body against rickets. The amount of ultraviolet light in sunlight varies with the season and

violet light is impossible in northern climates during the winter months and for this reason some other source of vitamin D needs to be provided.

Animal experiments have helped to answer many questions and determine the most potent sources of vitamin D. Rickets may be produced experimentally in rats, chicks, dogs and other animals by feeding a ration disproportionately high in calcium, low in phosphorus and deficient in vitamin D or ultraviolet light. These animals will develop characteristic rachitic symptoms similar to

signs in a live animal. These characteristic symptoms may be prevented or corrected when an adequate source of vitamin D is provided.

Vitamin D is the only vitamin that has been demonstrated to have specific toxicity when administered in overdosage. Usually toxicity is not manifest except after huge doses, such as 500,000 I.U. daily (compare with daily requirements

mins, vitamin D can be stored to some extent in the animal body, primarily in the liver. The reserve is depleted more rapidly when the calcium-phosphorus ratio is far from the normal, as it is in rachitic rations used for experimental purposes. For children who receive an adequate source of calcium and phosphorus, the requirement for vitamin D seems to be much less than for those who have a deficient intake or disturbed utilization of bone-building elements. When pregnant and nursing mothers are provided with an abundant source of vitamin D, they are able to pass on some degree of antirachitic activity to the young, both prenatally and through the

ment will resist the disease.

Rats to be used for vitamin D assays must be from a special colony fed on a ration low enough in this factor so that the young will not have a large reserve. Experimental rickets is difficult to produce when young rats are protected by vitamin D stored prenatally.

Properties and Forms of Vitamin D. Research on the chemical nature of vitamin D was initiated in 1924, when Steenbock and Hess demonstrated independently that antirachitic activity could be induced in foods by exposure to ultraviolet light. It soon followed that the factor activated was associated with fat, and that two fatlike compounds known as ergosterol and cholesterol were the precursors from which vitamin D was produced by the action of ultraviolet rays. The two important forms are vitamin D_2 (calciferol made by irradiation of ergosterol) and vitamin D_3 (formed by irradiation of a form of cholesterol). There is evidence it

permitted the manufacture of a concentrated vitamin D preparation such as viosterol (irradiated ergosterol in oil) long before the pure crystalline vitamin D (calciferol) was isolated in 1935.

Measurement of Vitamin D. The

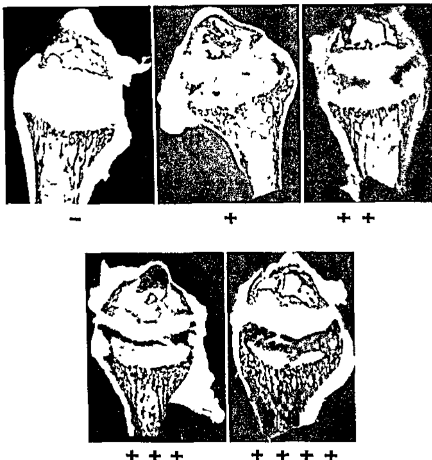


Fig 21 Progressive degrees of recalcification or healing of rachitic bones due to graded doses of vitamin D The increasing extent of the dark areas, where the white band appeared in the first photo, indicates mineral deposits Photo marked ++++ represents one Steenbock or 2 7 U S P units of vitamin D (Wisconsin Alumni Research Foundation)

International Unit (I.U) of vitamin D

of experimental rickets are roentgenograms, total mineral content of bone and calcification of the metaphysis (the growing portion) of the long bones The last observation has been used in developing the standardized line test on rats universally employed for routine assays of vitamin D preparations Rats are fed on a rickets-producing diet until a definite stage of early rickets occurs, then the source of vitamin D or product to be tested is fed and the animals are sacrificed on the 11th day. Longitudinal sections of certain bones are stained in

silver-nitrate solution that darkens only

administered

Human Requirements. Who needs vitamin D and how much is needed? These questions have stimulated much research on this subject Jeans and Stearns[1] stated the basis for requirements as "those amounts which, with ample intakes of calcium and phosphorus and a diet otherwise adequate, insure sufficient retention of calcium and phosphorus to permit (a) normal growth and mineralization of the skeleton and teeth of infants and children, (b) maintenance of bony and dental structures dur-

A quantitative estimate for children depends upon the age of the child, the rate of growth, the type of food eaten and the exposure to sunlight. Premature and rapidly growing infants need more than others, breast-fed infants less than those fed on cow's milk, children under 2 years more than older children because they are more susceptible to rickets There is some evidence that vitamin D is effective in reducing the incidence of dental caries in preschool and school-age children Thus, the figures given for recommended vitamin D allowances for infants and children are subject to many variables that are covered by giving 400 I U. The same amount is recommended for older children and adolescents.

for all persons deprived of sunlight and for elderly persons According to the Food and Nutrition Board recommendations, other adults probably have little need of vitamin D

Natural and Artificial Sources. The natural distribution of vitamin D in common foods is limited to small, and often insignificant, amounts in cream, butter, eggs and liver. Thus, we have come to depend upon fortified foods, fish-liver oil or concentrates for preventive and therapeutic use.

Vitamin D milk is one of the best and most available fortified foods. Most of the vitamin D milk now on the market is produced by adding a vitamin D concentrate to the milk and then homogenizing it to maintain an even distribution of the fat. The present standard of 400 I U. per quart means that a quart of milk provides a day's requirement of vitamin D Most brands of evaporated milk also have vitamin D added. Promiscuous fortification of a variety of other foods with vitamin D does not seem to be either desirable or necessary.

For children who never receive any vitamin D supplement, a food fortified with extra vitamin D may be desirable The Council on Foods of the American Medical Association expresses the opinion.[2]

"Of all the common foods available, milk is the most suitable as a carrier of added vitamin D. Vitamin D is concerned with the utilization of calcium and phosphorus, of which milk is an excellent source."

Of the numerous fish-liver oils investigated there is a wide range of potency. This seems to vary with the season of the catch and the oil content of the livers The highest potency oil often comes from fish that give the lowest yield of oil

Concentrates are made from the natural fish-liver oils or by irradiating pure ergosterol and cholesterol. Such preparations are labeled with the exact units per dose or per capsule and are prescribed accordingly. A protective dose to meet the daily requirement is considerably less than what may be prescribed as a curative dose.

Stability. Vitamin D in foods and in

[1] Jeans, P, and Stearns, G: J.A M.A. 111,703, 1938.

[2] Council on Foods J.A M.A. 108 206, 1937.

food concentrates is remarkably stable to heating, aging and storage. Vitamin D milk that is warmed for the baby or the cod-liver oil that may have been kept over a season is still a reliable source of this factor.

VITAMIN E (TOCOPHEROL)

Physiologic Significance. The existence of a dietary factor essential for reproduction in the rat was recognized in the early 1920's by Evans, it was given the name vitamin E or antisterility factor by Sure in 1924. Most of the experimental work has been done on rats, the males and the females being affected differently Vitamin E deficiency leads to destruction of germ cells in the testes of the male and thus to permanent sterility In a female, mated with a normal male, ovulation and implantation of the ovum may take place normally, but about half way through the gestation period resorption of the developing fetus occurs and no young are born. With less severe vitamin E deficiency, which may permit the birth of a weakling litter, the chances of survival are poor because this same deficiency seems to interfere with lactation or later with growth of the young

There is less agreement about the need of larger animals for vitamin E, but there is some evidence that cattle and swine do require it Evidence points to a close correlation between the vitamin E content of the diet of hens and the hatchability of their eggs and the viability of the chicks that are hatched. The role of vitamin E in human reproduction and its possible therapeutic usefulness in the prevention of abortion is controversial but worthy of further study

Earlier work on nutritional muscular dystrophy in rabbits has recently been repeated with other animals, and the nutritional deficiency factor has been identified as vitamin E. Clinical evidence, however, indicates that vitamin E is of little or no significance in human muscular dystrophy or similar muscular diseases

Storage. It requires several months for rats to use up their reserve and to become sterile due to a diet deficient in vitamin E. Vitamin E is stored in muscles and in fatty tissues and not in the liver, as are the other fat-soluble vitamins

Properties and Forms of Vitamin E. Three naturally occurring compounds have vitamin E activity. They are fat-soluble alcohols of high molecular weight, closely related in structure and called alpha-, beta- and gamma-tocopherols. Alpha-tocopherol is the most active form. Tocopherols are more stable than most other vitamins, but they are destroyed when in contact with rancid fats. Alpha-tocopherol deteriorates on exposure to light and decomposes upon irradiation with ultraviolet light. Contact with lead and iron hastens destruction.

Vitamin E has become important in food technology because of its antioxidant property. It helps to prevent deterioration of certain foods by oxidation. This same characteristic may exert a protective action upon vitamin A in the body

Human Requirement The uncertainty regarding the significance of vitamin E in human nutrition precludes any possibility of determining human requirement

Food Sources. Wheat germ and wheat-germ oil afford the richest source of this factor, but it is so widely distributed in common foods that it is even difficult to obtain for experimental purposes a food mixture that is deficient in vitamin E Tests show that vitamin E is present in cereal germs, egg yolk, legumes, nuts, leafy vegetables and vegetable oils.

VITAMIN K (MENADIONE AND DERIVATIVES)

Physiologic Significance. A severe hemorrhagic disease in newly hatched chicks was recognized by Dam in Co-

penhagen in 1935. The chick ration was adequate in protein, in minerals and in feeding alfalfa The antihemorrhagic factor found in these materials Dam called vitamin K–Koagulationsvitamin.

This discovery and also the identification, the isolation and the synthesis of compounds with vitamin K activity have made possible extensive clinical use of

FAT-SOLUBLE VITAMINS

	A	D	E	K
ACTIVE CHEMICAL FORMS	(PROVITAMIN) CAROTENE	CALCIFEROL	TOCOPHEROL	VITAMIN K_1 AND K_2 AND MENADIONE
Important food sources	Liver Egg yolk Butter, cream, margarine Green and yellow vegetables Apricots Cantaloupe	*Irradiated foods* Small amounts in Butter Egg yolk Liver Salmon Sardines Tuna fish	*Wheat germ* Leafy vegetables Vegetable oils Egg yolk Legumes Peanuts Margarine	*Cabbage* Cauliflower Spinach Other leafy vegetables Pork liver Soybean oil and other vegetable oils
Concentrates or pharmaceutical sources	Fish-liver oil	Fish-liver oil Viosterol	Wheat-germ oil	Synthetic
Stability to cooking, drying, light, etc	Gradual destruction by exposure to air, heat and drying more rapid at high temperatures	Stable to heating, aging and storage Destroyed by excess ultraviolet irradiation	Stable to all methods of food processing Destroyed by rancidity and ultraviolet irradiation	Stable to heat, light and exposure to air Destroyed by strong acids, alkalis and ox. agents
Function: Essential in	Maintaining function of epithelial cells, skin, mucous membranes, visual purple	Calcium and phosphorus absorption and metabolism	Maintaining function of reproductive and muscular tissues	Clotting of blood —necessary in formation of prothrombin
Deficiency manifest as	Night blindness Glare blindness Rough, dry skin Dry mucous membranes	Rickets Soft bones Bowed legs Poor teeth Skeletal deformities	Sterility in males (rats) Resorption of fetus (females) Muscular dystrophy in rats and rabbits	Slow clotting time of blood Some hemorrhagic disease of newborn Lack of prothrombin
Adult human requirement	5,000 I. U.	Children and adolescents, 400 I. U.	Unknown	Unknown

this vitamin for the control and the prevention of some types of hemorrhage When there is a fall of the prothrombin level of the blood, such as occurs in hemorrhages associated with hepatic or biliary disease, vitamin K appears to be specific This factor apparently is necessary for the liver cells to perform their normal function of forming prothrombin.

Vitamin K deficiency in food probably is rare, but the deficiency state is caused more likely by failure to absorb or utilize the vitamin in the food The absorption of vitamin K from the intestine seems to be dependent upon the presence of bile and the normal digestion and absorption of fats The use of mineral oil in reducing diets or as a laxative interferes seriously with the absorption of vitamin K In pregnancy especially, the use of mineral oil should be discouraged, as the resulting low prothrombin level may predispose to hemorrhage, miscarriage or hemorrhagic disease of the newborn

Storage. Vitamin K is not stored easily in the body, but, according to the information in clinical reports, whatever is stored is found in the liver.

Properties and Forms of Vitamin K. Vitamin K, one of the fat-soluble vitamins, is a yellowish crystalline substance At least two forms of this vitamin (K_1 and K_2) occur naturally, and a number of simpler substances with antihemorrhagic properties have been synthesized They are heat resistant but are destroyed by alkalis, strong acids and certain oxidizing agents In the concentrated form vitamin K seems to be sensitive to light.

Measurement of Vitamin K Activity. Vitamin K activity can be measured in terms of micrograms of the pure synthetic compound, and the activity of other substances can be expressed in similar terms.

One method of assay uses young chicks and is based on the minimum dose that will maintain the normal coagulation time of the blood at the end of 1 month.

Human Requirement. For most people the vitamin K content of the average diet is adequate, and no quantitative estimate of human requirement has been attempted

The prophylactic use of vitamin K in the prevention of hemorrhage in the newborn is now recommended and practiced in many hospitals Oral administration of a vitamin K preparation to the mother before delivery and 1 dose of 1 to 2 mg intramuscularly to the infant immediately after birth are suggested as a practical public-health measure

Sources. Vitamin K is fairly widely distributed in foods It appears abundantly in cauliflower, cabbage, spinach, pork liver, soybeans and, to a lesser extent, in wheat and oats Alfalfa is the richest known source

STUDY QUESTIONS

1 How was the word *vitamin* derived? Can you define a vitamin as distinct from any other food nutrient?

2. Give some events and names of people of interest in the history of vitamin discoveries

3 Describe the function of each of the fat-soluble vitamins and good food sources of each, if there are any

4 Does the depth of yellow color in

small in natural foods, what commercial process is used to produce vitamin D foods? Which foods are commonly fortified with vitamin D?

6 When is a deficiency of vitamin K most likely to occur and what prophylactic measures are recommended?

7 Vitamin E has 2 seemingly unrelated functions By what vitamin E deficiency symptoms in animals are these 2 functions demonstrated?

8. Are any of the fat-soluble vitamins toxic if used in too large quantities? For which one is special caution necessary when concentrates are administered to infants?

ee Bibliography in Part Four for other pertinent material on the topics discussed in this chapter.

Ascorbic Acid (Vitamin C)
Vitamin B Complex: Thiamine (B_1), Riboflavin (B_2), Niacin (Nicotinic Acid), Vitamin B_6 Group, Vitamin B_{12}, Folacin (Folic Acid), Pantothenic Acid, Biotin, Other B Complex Factors
Antivitamins

CHAPTER EIGHT

Water-Soluble Vitamins

ASCORBIC ACID (VITAMIN C)

Physiologic Significance. The history of the recognition of scurvy as a deficiency disease in man and of its subsequent control by antiscorbutic foods is discussed in Chapter 20 The discovery that experimental scurvy could be produced in guinea pigs was made by Holst and Frolich in Norway in 1907 Guinea pigs develop characteristic hemorrhages around joints, teeth and other bony structures similar to the disease in man Other animals—the rat, the chicken, the dog and certain domestic animals—fail to develop any sign of scurvy when deprived of vitamin C because they are able to synthesize this factor in their bodies Man, monkeys and guinea pigs do not have this ability and, therefore, must depend upon the vitamin C in their food.

Vitamin C has several functions in bones and cartilage, gums and teeth (dentin) Ascorbic acid may also play a part in the formation of blood cells in the bone marrow and in the maintenance of normal hemoglobin levels.

Clinical experience with a number of diseases, such as tuberculosis, pneumonia and rheumatic fever, shows a decreased excretion of ascorbic acid even with an increased intake. There is some question as to whether a suboptimal intake of vitamin C is a predisposing cause of any of these diseases or whether there actually is some increased demand for vitamin C as a result of the disease. Interpretation of these findings must await further research. However, we do know that ascorbic acid is essential for the normal healing of wounds and is now being used therapeutically to speed recovery from surgical operations.

Storage The promptness with which man excretes an excess intake of vitamin C in the urine indicates limited powers of storage. The rapid appearance of symptoms of scurvy in guinea pigs on scorbutic rations is further evidence of poor storage After periods of depletion or shortage when ascorbic acid is again supplied more vitamin is retained until the tissues seem to become



Fig. 22. Scurvy results from vitamin C deficiency. Guinea pigs are used for experiments in vitamin C because they need a food source of this factor, even as humans do. (*Left*) Normal guinea pig. (*Right*) Scorbutic guinea pig. (Nutrition Laboratory, Battle Creek Sanitarium)

saturated. Following saturation the excess is again excreted. It is generally believed that a habitual intake of vitamin C of between 80 and 100 mg. daily will keep a person in a state approaching saturation, which condition is probably more conducive to optimum health than one in which there is no reserve.

Properties of Ascorbic Acid. By 1932 the isolation of vitamin C in pure crystalline form had been accomplished by two groups of workers, one in Pittsburgh and one in Hungary. The chemical structure was identified, and the product was synthesized in physiologically active form soon after that. "Ascorbic acid" was officially accepted in 1938 as the chemical name to be given to vitamin C. Ascorbic acid dissolved in water is strongly acid to taste, but in this form it is unstable. However, in fruit juices it is oxidized less rapidly, owing to the acidity of the juices and the protective substances in them. Ascorbic acid in turn prevents the oxidative discoloration of fruits. In tablet form it is inexpensive and stable if kept free from moisture.

Measurement of Ascorbic Acid. Ascorbic acid can be conveniently measured chemically, and its potency is expressed in milligrams. It is an active reducing agent and bleaches certain dyes rapidly. This property is used in the quantitative determination in foods and tissues.

Guinea pigs always have been the preferred experimental animals for bioassay work because of their susceptibility to a deficiency of ascorbic acid, and they are still used for demonstration and comparative assays (Fig. 22).

Human Requirement. Elaborate studies have been made to determine human requirements for ascorbic acid at different ages, under different conditions of environment, under physical exertion, in fevers and in infections. The amount necessary to prevent frank symptoms of scurvy in humans is far less than that recommended for an optimum state of health. Saturation tests after graded levels of intake and observations on blood ascorbic acid have been the chief technics used for studying human requirements. On the basis of such studies the National Research Council recommends 75 mg. for an average man and 70 mg. for a woman, 100 mg. during pregnancy and 150 mg. during lactation. Growing children need relatively more than adults. (*See* table, Chap. 10.) During and following fevers and infections the demand for ascorbic acid seems to be increased, either because of rapid

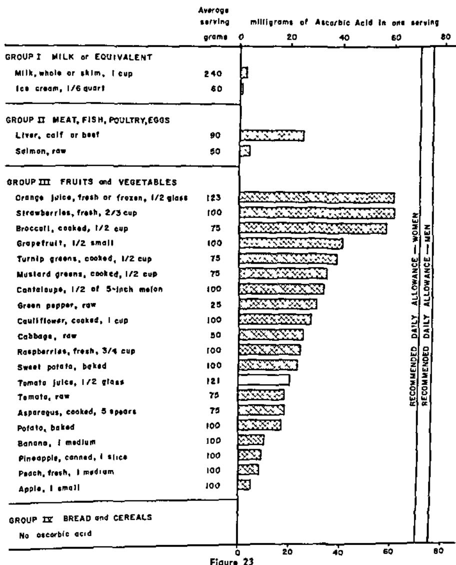


Figure 23

destruction or of an increased need. A regular and adequate intake of ascorbic acid is emphasized because of the poor storage and constant need Food sources are usually adequate, except in pathologic states or when fresh foods are not available.

Food Sources. It is obvious from the bar charts (Fig 23) that the commonly used fruits and vegetables of Group 3

are the richest sources of ascorbic acid, with citrus fruits, strawberries, cantaloupe and a number of raw, leafy vegetables topping the list. Canned or frozen citrus juice may be the cheapest source of vitamin C when fresh citrus fruit is scarce or expensive, and may even be cheaper than tomato juice unless home canned, because it takes 3 times as much tomato to supply the same number of units of vitamin C.

In certain circumstances other sources of ascorbic acid are worthy of consideration. Potatoes may become an important source when used in large quantities,

party in the Antarctic running low on antiscorbutic foods That mother's milk contains more vitamin C than pasteurized cow's milk may alter the amount of orange juice and the time of adding it to the baby's schedule. Mother's milk contains more ascorbic acid than average cow's milk and considerably more than is found in pasteurized milk.

Vitamin C is one of the most difficult nutrients to supply in adequate amounts to troops or civil populations in wartime because of its instability in stored foods In World War II army rations included a lemon powder fortified with ascorbic acid. If men did not like lemonade, as was frequently the case, the ration was low in this factor

In some countries indigenous fruits

(acerola), or West Indian cherry, has the highest ascorbic acid content of any known food [1] Only recently has attention been called to it, and the acerola is now becoming popular In Great Britain, during World War II, rose-hip and black-currant sirups or jams served to supplement the meager supply of vitamin C from garden vegetables. Even before the war in northern Russia an extract of pine needles rich in vitamin C was being added to berry juice as a health beverage for school children In another part of northern Europe raw turnip juice saved the lives of infants who otherwise would have died of scurvy

Stability in Foods. Of all the vitamins, ascorbic acid is the most unstable to heat, oxidation, drying and storage. Alkalinity, even in a slight degree, is distinctly destructive to this vitamin, therefore, soda never should be added to food in cooking. Acid fruits and vegetables lose much less ascorbic acid upon heating than nonacid foods Vitamin C is extremely soluble in water and dissolves out of vegetables during the first few minutes in the process of cooking

To reduce as much as possible the loss of ascorbic acid in cooking vegetables, the use of the least possible amount of cooking water, short cooking time (water should be boiling when vegetable is added) and little chopping or cutting is recommended Studies have shown that baked, boiled or steamed potatoes retain a large proportion of their vitamin C if cooked whole. Fresh fruits and more especially vegetables lose vitamin C activity rapidly when stored at room temperature and somewhat less rapidly at refrigerator temperatures Expert advice is not to shell peas, cut beans, peel vegetables until ready to cook Quick freezing of fruits and vegetables destroys little if any of this factor. To retain a maximum of the ascorbic acid, frozen fruits should be used promptly after thawing, and frozen vegetables should be plunged directly into boiling water for immediate cooking

Vitamin P or citrin is a term applied

[1] del Campello, A., and Asenjo, C. F · J Agriculture 61·161, 1957.

in being yellow plant pigments and relatively stable They are present in the rind of citrus fruits (hence the name citrin), and they are also present in other fruits and green leaves.

VITAMIN B COMPLEX

Discovery and Early Significance. As early as 1897, Eijkman, a Dutch physician stationed in Java, noticed that the poultry at the prison hospital showed symptoms similar to those of his patients suffering from beriberi. This malady developed in the chickens when they were fed on the polished-rice table scraps thrown out from the prison, and recovery followed when other food was given. The results of the investigation were published in an obscure journal. Years later attention was given to the findings, and great scientific significance was attached to them Eijkman had discovered that there was a deficiency in polished rice, but he did not realize its significance.

Experimental work with rats, pigeons and cen hitl came to be known as vitamin B. Animals deprived of this factor lost appetite, ceased to grow and often developed characteristic symptoms of polyneuritis, a loss of muscular control and partial paralysis. Many of these symptoms in animals were similar to those of beriberi in man, particularly the effect upon the nervous system.

Subdivision into Separate Factors. Numerous workers began to observe a complexity of symptoms due to deficiencies among peoples with different dietary patterns. These reports were confusing until the discrepancies in experimental

designation—letter, descriptive name or chemical term—as research progressed to disclose the chemical nature of each

At present some 12 fractions of the vitamin B complex are generally recognized, and others are postulated. Those discussed in this chapter are thiamine, riboflavin, niacin, vitamin B_6, vitamin B_{12}, folacin, pantothenic acid and biotin, with brief comments about several others.

Distribution and Properties. Certain properties, the solubility in water and the distribution in many common foods are similar for all members of the B complex. The very fact that several of the fractions occurred together in the same food gave rise to the early idea that there was only one substance. New factors identified are classified as belonging to the B complex if they are water soluble and are abundant in liver and yeast. Dry yeast is the richest natural source of the B complex, and new strains of yeast are being developed with varying proportions of the different factors

Therapeutic Use. Concentrates of vitamin B complex manufactured by pharmaceutical houses usually are made from liver, yeast or rice polishings The proportion of the various factors present depends somewhat upon the source or the combination of sources. Synthetic vitamins may be combined in any desired proportion in the preparation of B complex mixtures Obviously, a proportion of factors corresponding approximately to human need would be most desirable. It is concluded from clinical work that the whole B complex is often superior therapeutically to any single fraction

Thiamine (Vitamin B_1)

Physiologic Significance. The poly-

min B_1 fraction of the B complex In 1910, R. R. Williams became interested in beriberi in the Philippines and in the

curative effects of rice polishings. He started a 26-year search for the active principle in rice polishings, bran and other natural foods Later it was named thiamine, as descriptive of its chemical nature

Even a mild deficiency of this factor may cause anorexia (loss of appetite) and inanition in all types of animals and man. Early recognition of the necessity of this vitamin for normal growth has since been supplemented by the knowledge that it is important throughout life in tissue respiration There is an intricate interrelationship between thiamine and carbohydrate metabolism in the tissues [illegible]

A common complaint often due to a mild thiamine deficiency, but not always recognized, is atonic constipation and poor intestinal muscle tone It is possible that the muscle-nerve mechanism of internal organs is more susceptible to this deficiency than that of the skeletal muscles, which become paralyzed only when the deficiency is severe Certain British workers suggest that the degree of slowing of heartbeat (bradycardia) may be indicative of this deficiency.

Work conducted at the Mayo Clinic has disclosed the characteristic syndrome of early thiamine deficiency in human subjects. Thiamine alone was restricted in the diet of some nurses and other volunteers. These subjects were under careful supervision as to food, and the urinary excretion of thiamine was also checked. Williams *et al* summarize their findings as follows [2]

"The degree of disability induced by withdrawing thiamine from otherwise adequate diets of these persons was impressive Fatigue appeared, interest in [illegible] complaints were heard. The heart sounds became faint, blood pressure fell, the pulse was irritable, and, as the duration of the restriction was prolonged, abnormalities in the action of the heart and mobility of the stomach and intestine could be recorded with special apparatus."

[2] Williams, R D , *et al* · Arch Int. Med. 66 785, 1940

Storage. Thiamine cannot be stored to any extent in the animal body. Therefore, it is important that it be supplied regularly in the diet. In America the food supply is such that one is relatively sure to have enough thiamine to prevent beriberi but frequently not enough to ensure optimum health Many a vague symptom of tiredness or chronic constipation may be aggravated by suboptimal intake of thiamine. Many animals, especially cattle and other ruminants, synthesize thiamine and other factors of the vitamin B complex by bacterial action in the alimentary tract.

Properties of Thiamine. Thiamine was first synthesized by R R. Williams in 1936 as a climax to his 26 years of interest in the subject The pure vitamin, usually sold as thiamine chloride, has a yeasty taste and odor and is water soluble The natural and the synthetic products are identical in physiologic activity In the dry state thiamine chloride is stable and is not easily destroyed by heat or oxidation In water solution it is less stable, but more stable in acid than in neutral or alkaline medium.

Measurement of Thiamine. Thiamine content of foods may be given in milligrams or micrograms (1 mg = 1,000 mcg) Human requirements and potency of synthetic compounds or concentrates are expressed more often in milligrams.

Chemical and microbiologic methods of assay have largely replaced the older bio-assay methods, in which rats and pigeons were used as experimental animals. Now that these rapid methods of assay are available, extensive determinations of vitamin values of foods before and after storage and cooking are pos-

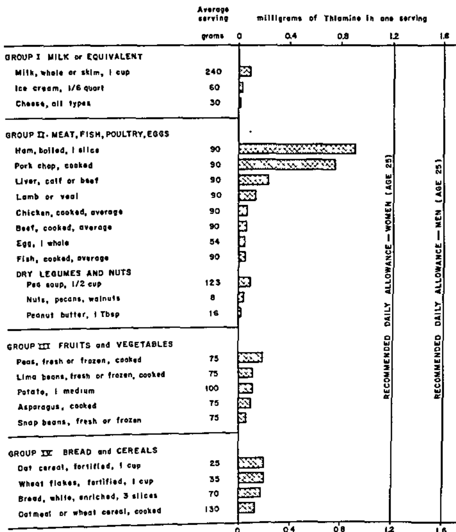


Figure 24

sible, and tables of food values are being revised to include such figures

Human Requirements. Adult human thiamine requirements tend to parallel energy expenditure except for extremes of caloric intake. Thus the Food and Nutrition Board recommends from 1.3 to 1.6 mg. for men and from 1.0 to 1.2

mg for women, varying with age and the degree of activity, and relatively more during growth, pregnancy and lactation (*See* table, Chap 10.)

Food Sources. Thiamine is widely distributed in a large variety of animal and vegetable tissues, but there are few foods in which it occurs in abundance This is strikingly emphasized in Figure 24, which shows the thiamine content of average servings of some common foods It is evident that it takes several servings of even the better sources of thiamine to meet the recommended allowance Therefore, enrichment of bread and cereals was instigated to make it easier for the average person to meet his requirement economically Since bread constitutes about one fourth of the calories in the average American diet, and since only a very small fraction of the bread consumed in this country is made from whole wheat, the enrichment of white flour and bread with thiamine, riboflavin, niacin and iron was a logical step toward improving the level of nutrition in the United States For more details about enriched flour and bread see Chapter 2.

Dry yeast and wheat germ are the richest natural sources of thiamine, but they are eaten only in relatively small amounts Moist baker's yeast has only from one-eighth to one-tenth of the th

thiamine in cooking are dependent upon several factors, such as type of food, method of preparation, temperature, length of cooking and acidity or alkalinity of the cooking medium Research in the losses of nutrients in food processing indicates that on the whole fresh vegetables retain thiamine well during cooking From a trace to 15 per cent is dissolved in the cooking water, and up to 22 per cent may be destroyed by cooking If the cooking water is discarded, thiamine losses may be from 20 to 35 per cent.

In acid foods this vitamin is quite stable, but its activity is destroyed rapidly by sulfite, a fact which may explain the loss of thiamine in dried fruits, such as apricots and peaches, treated with sulfur.

Thiamine is well retained in cereals, since they generally are cooked slowly and at a moderate temperature and the cooking water is used. Baked products lose about 15 per cent of their original thiamine. Generally, the losses in cooking meat are greater than in other foods, ranging from 25 to 50 per cent of raw value. Foods stored in their natural condition lose remarkably little thiamine

Riboflavin (Vitamin B_2)

Physiologic Significance. The second member of the B complex—riboflavin was synthesized in 1935. This factor is associated with normal growth and development, both in mammals and in birds Like thiamine, riboflavin plays an important role in tissue respiration It combines with phosphoric acid and protein to form enzymes that control some of the oxidations involved in the life processes of living cells.

Sebrell and co-workers have demonstrated that riboflavin deficiency in man may be characterized by pallor of the mucous membrane of the lips and splitting of the lips at the angles of the mouth, a condition known as cheilosis

Riboflavin also plays an important role in relation to the eye Ocular symptoms appear consistently on a low riboflavin diet and may precede all other manifestations Eyestrain and fatigue, itching and burning, sensitivity to light and frontal headaches are the most frequent complaints Cataracts have been observed in rats, mice, chickens and monkeys after prolonged deficiency of riboflavin. In man, riboflavin deficiency is apt to occur along with a deficiency of other members of the B complex.

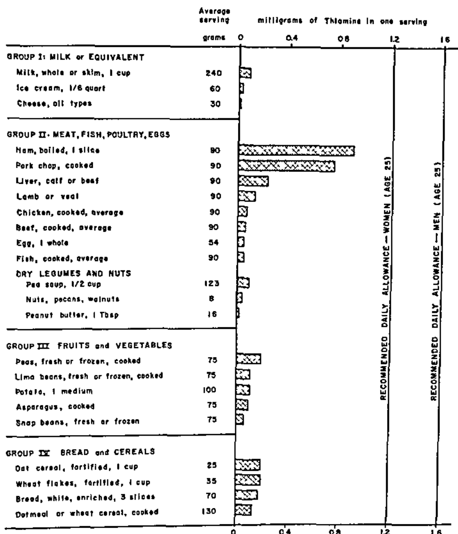


Figure 24

energy expenditure except for extremes of caloric intake. Thus the Food and Nutrition Board recommends from 1.3 to 1.6 mg for men and from 1.0 to 1.2

Storage. There is no great storage capacity in the body for this vitamin. It has been suggested that under stress the body can conserve its store of riboflavin much better than it can conserve thiamine

Properties of Riboflavin. Riboflavin in water solution has a yellow-green fluorescence. Although it is stable to heat, acid and oxidation, it is sensitive to alkali and in solution is easily destroyed by light This vitamin always should be kept in dark bottles.

Measurement of Riboflavin. The only reliable unit for riboflavin is the metric weight of the pure substance. Human requirements for this vitamin are expressed in milligrams and the [illegible] ing the riboflavin content of foods, tissues, etc.

Human Requirement. Unlike thiamine, the human requirement for riboflavin does not seem to be related to energy expenditure The Food and Nutrition Board recommends 1 8 mg. for men and 1 5 mg for women, regardless of activity The greater relative need for riboflavin during growth, pregnancy and lactation is reflected in the specific recommendations for these categories. (*See* table, Chap 10)

Food Sources. Riboflavin is widely distributed in animal and in vegetable foods, but only in small amounts in most of them Organ meats, milk and green leafy vegetables are the outstanding food sources This is strikingly emphasized in Figure 25, which shows the riboflavin content of average servings of some common foods and the contribution they make toward the day's requirement

Dry yeast is the richest natural source, but this product is not generally consumed in large amounts The average person is not apt to get an optimum amount of riboflavin unless he consumes a generous amount of milk. The addition of riboflavin in the enrichment of flour and bread has helped to raise the average intake

Stability in Foods Riboflavin is stable to ordinary cooking processes Several investigators have made tests of the amount of destruction of riboflavin in milk, since it is an important source of this vitamin Results of these studies show that the destruction by light is significant and likely to be more serious while in the bottle that has been left outside the door than during processing or cooking. One half or more of the riboflavin is lost in 2 hours if milk bottles are allowed to stand in sunlight. Paper cartons protect milk against such losses

Niacin (Nicotinic Acid)

Physiologic Significance. When Elvehjem reported the spectacular cure of blacktongue in dogs by means of nicotinic acid, now known as niacin, the logical supposition was that a niacin deficiency might be the cause of pellagra in humans Later, Spies and others demonstrated that most of the classic symptoms of pellagra were relieved by the administration of niacin However, most persons suffering from pellagra have multiple deficiencies, and it has been found that certain symptoms formerly associated with the disease are not relieved until thiamine and riboflavin are supplied along with niacin Earlier concepts of pellagra being related to a protein deficiency have been clarified by the discovery that one of the amino acids—tryptophane—is a precursor from which niacin may be synthesized in the animal body. Niacin is associated also with the enzyme systems in tissue respiration. Human pellagra is discussed fully in Chapter 20.

Storage. Little is known regarding the extent of storage of niacin in the body, but probably it is stored in the liver. It is eliminated in the urine largely as derivatives and, to a smaller extent,

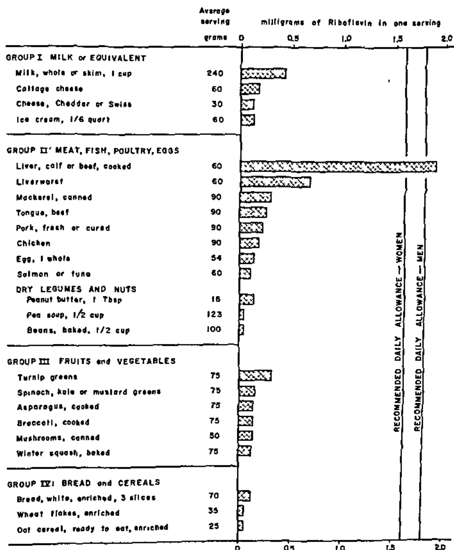

RIBOFLAVIN
In Average Servings of Foods
Classified in the Four Groups
Average serving grams
milligrams of Riboflavin in one serving
0
0.5
1.0
1.5
2.0
GROUP I MILK or EQUIVALENT
Milk, whole or skim, 1 cup 240
Cottage cheese 60
Cheese, Cheddar or Swiss 30
Ice cream, 1/6 quart 60
GROUP II MEAT, FISH, POULTRY, EGGS
Liver, calf or beef, cooked 60
Liverwurst 60
Mackerel, canned 90
Tongue, beef 90
Pork, fresh or cured 90
Chicken 90
Egg, 1 whole 54
Salmon or tuna 60
DRY LEGUMES AND NUTS
Peanut butter, 1 Tbsp 16
Pea soup, 1/2 cup 123
Beans, baked, 1/2 cup 100
GROUP III FRUITS and VEGETABLES
Turnip greens 75
Spinach, kale or mustard greens 75
Asparagus, cooked 75
Broccoli, cooked 75
Mushrooms, canned 50
Winter squash, baked 75
GROUP IV BREAD and CEREALS
Bread, white, enriched, 3 slices 70
Wheat flakes, enriched 35
Oat cereal, ready to eat, enriched 25
RECOMMENDED DAILY ALLOWANCE — WOMEN
RECOMMENDED DAILY ALLOWANCE — MEN

Figure 25

NIACIN

In Average Servings of Foods
Classified in the Four Groups

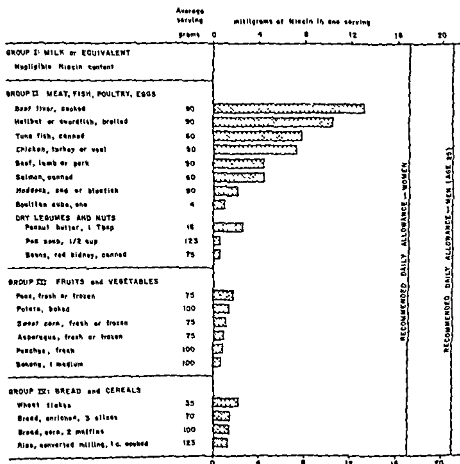


Figure 26

as free niacin. This diversity of end products has added to the difficulties of metabolic studies in niacin.

Properties of Niacin. Nicotinic acid has long been known as a simple organic

unlike some other members of the B complex, it is even stable to alkali. Nicotinic acid is commonly called niacin to avoid confusion because it has none of the physiologic properties of nicotine found in tobacco

Two forms of this vitamin—niacin and niacinamide—have antipellagra activity. Therapeutic doses of niacin may cause temporary flushing or hot flashes, but









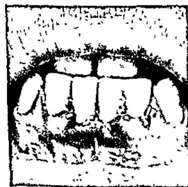




PLATE 2

(*Top, left*) Dermatitis of hands and neck in a case of pellagra. (New York)

(*Top, right*) Beefy red glossitis in a patient with multiple B complex deficiency. This is characteristic of pellagra or sprue. (New York)

(*Center, left*) Late chronic glossitis with complete papillary atrophy, probably resulting from prolonged B complex deficiency. (Newfoundland)

(*Center, right*) Angular stomatitis and dermatitis, probably due to a riboflavin deficiency (Grace A. Goldsmith, M D, Tulane University)

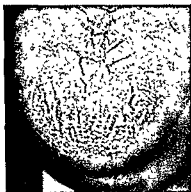
(*Bottom, left*) Advanced gingivitis marked swelling of papillae with loss of tissue and retraction of gums (Newfoundland) Nutritional factors most apt to be associated with such a condition in Newfoundland are ascorbic acid and some of the B vitamins

(*Bottom, right*) "Granulated" eyelids, or conjunctival follicular hypertrophy, is common in malnourished children It begins with reddening and thickening of the lower lid (Florida)

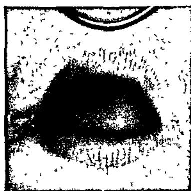
(Plate 2 courtesy of Jolliffe, Norman, Tisdall, F. F., and Cannon, Paul R. Clinical Nutrition, New York, Hoeber, 1950)

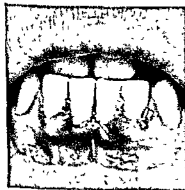
Plate 2













niacinamide does not produce this reaction

Measurement of Niacin. Niacin in foods and niacin requirement are both expressed in milligrams of the pure chemical substance.

Chemical and microbiologic methods [illegible]

based upon the blacktongue-preventing value.

Human Requirement. Evidence of the human requirement for niacin is rather meager. Most of the clinical evidence is based upon doses of niacin effective in the cure of pellagrous symptoms, and it is well known that curative doses are usually much larger than preventive ones. It has been assumed that the niacin requirement may vary with energy expenditure, as seems to be true with thiamine Niacin requirements can be established only in relation to the intake of tryptophan, since this amino acid is a precursor of niacin in the body Therefore, in the 1958 revision, the Food and Nutrition Board recommend in terms of "Niacin equivalents" a range of 21 to 18 mg. per day for men and 17 mg. for women (*see* Chap 10).

Food Sources. In general, meat, poultry and fish are better sources of niacin than plant products, as emphasized in Figure 26, showing average servings. The use of meat drippings is recommended, because niacin is easily dissolved out of foods in cooking. Whole-grain and enriched products make an appreciable contribution Fruits and vegetables other than mushrooms and legumes are insignificant sources of niacin Milk and eggs are poor sources of preformed niacin but good sources of its precursor tryptophan.

Vitamins in Pattern Dietary for One Day

The contribution made by the Basic

VITAMINS IN PATTERN DIETARY FOR *1 DAY**

FOOD GROUP	AMOUNT IN GM.	HOUSEHOLD MEASURE	CALORIES	VITAMIN A *I U.*	THIAMINE *MG*	RIBOFLAVIN *MG.*	NIACIN *MG.*	ASCORBIC ACID *MG.*
Milk or equivalent	488	2 c. (1 pint)	332	780	.18	.84	6	6
Egg	54	1 medium	77	550	05	.14		..
Meat, fish, fowl	90	3-oz. serving	257	4,815	24	.51	5 7	3
Vegetables:								
Potato, cooked	100	1 medium	83	20	09	.03	1 0	14
Green, leafy or yellow	75	¾ c.	18	3,300	.06	.09	.5	21
Other	75	¾ c.	39	190	.07	.06	.7	10
Fruits:								
Citrus	100	1 serving	41	95	.06	.02	2	44
Other	100	1 serving	85	465	03	.04	.6	5
Bread, white, enriched	70	3 slices	189	.	.18	.12	1.5	..
Cereal, whole grain or enriched	30	¾ c. cooked or 1 oz. dry	80	.	.05	.03	.7	..
Butter or margarine	14	1 tablespoon	100	460			.	..
Totals			1,301	10,675	1 01	1 88	11.5	103

* *For basis* of calculation *see* Basic Dietary Pattern, Chapter 18.

Dietary Pattern to the 5 vitamins for which we have specific recommendations is given in the accompanying table. Since the pattern dietary provides only 1,300 calories, the foods chosen to supplement these will also provide additional vitamins to bring the totals up to the recommended allowances.

Vitamin B_6 Group

Physiologic Significance. Pyridoxine was identified in 1938 as a separate fraction of the B complex. Subsequently, vitamin B_6 proved to be a complex of 3 closely related chemical compounds— [illegible] that it is needed by most animals. A deficiency is associated with a peculiar type of anemia in some species, extreme *muscular weakness, dermatitis and nervous disorders* in others Vitamin B_6 can be synthesized by intestinal organisms in the rat, but whether or not this is true in humans has not been established.

The need for and the function of vitamin B_6 in humans has been demonstrated conclusively in both adults and infants. The accidental destruction of this factor in a canned-milk formula resulted in the occurrence of nervous irritability and convulsive seizures in young infants[3] Rapid recovery followed injection of the vitamin, proving conclusively that the symptoms noted were a result of a deficiency.

The mechanism of the action of pyridoxine and its several derivatives has been studied extensively. It is associated closely with the synthesis and the metabolism of the amino acid tryptophan and with the *metabolism of fats*. It also functions in the enzyme system, which facilitates the utilization of amino acids by the tissue cells Evidence available indicates that the daily intake of pyridoxine should be from 1 to 2 mg, which amount is readily provided by an ordinary diet.

Food Sources. Of the animal foods, pork and the glandular meats are the richest, with lamb and veal relatively better than fish or beef muscle. Milk and eggs are only fair sources. Of the plant foods, legumes, potatoes, oatmeal, [illegible]

content of foods is determined by a microbiologic method.

Vitamin B_{12}

Physiologic Significance. Ever since the discovery that liver was effective in the treatment of pernicious anemia research workers have been hunting for the active principle, or "extrinsic" factor, in liver. At first it seemed that folic acid was the answer, but it proved to be ineffective in relieving many of the symptoms of the disease In 1948, a more active substance, B_{12}, isolated from liver, was found to be effective in microgram quantities in the therapy of pernicious anemia (both uncomplicated and with neurologic involvement), as well as in other types of macrocytic anemias. Thus, vitamin B_{12} is probably identical with Castle's "extrinsic" factor The oral effectiveness of it is enhanced by the "intrinsic" factor found in normal gastric juice, as was true of the active factor in liver extracts The "intrinsic" factor appears to help in the absorption of the vitamin B_{12}.

The suggestion that vitamin B_{12} may act as a growth factor for children as it does for poultry, pigs and ruminants has not been well confirmed. The natural [illegible]

more, there is no evidence of a widespread deficiency of this factor among American children.

[3] Coursin, D. B: J A.M.A 154.406, 1954.

Properties of Vitamin B_{12}. The structure of vitamin B_{12} was established by Todd in 1955 as an extremely complex nitrogenous compound containing 1 atom of cobalt (cyanocobalamin) Cobalt, long known as a trace element essential for some animals, never before had been found in a natural organic compound.

Vitamin B_{12} is remarkably potent It has a biologic activity 11,000 times that of a standard liver concentrate formerly used in the treatment of pernicious anemia. Thus B_{12} appears to be one of the most potent biologically active substances known It has been administered therapeutically in doses of from 6 to 150 mcg Comparative effects with folic acid in other types of anemia require doses of from 20,000 to 50,000 mcg

Food sources of vitamin B_{12} have not been widely investigated, but on present evidence the content of liver and kidney is high, of milk, muscle meats and fish, medium.

Folacin (Folic Acid)

Physiologic Significance. Folic acid was first recognized as a dietary essential for chicks in 1938 and later was shown to be a requirement of other animals It is necessary for the hematopoietic (blood-forming) system in animals and man Folacin was first used clinically in 1945 by Spies, who showed it to be [illegible]

Folic acid is transformed within the living organism to a biologically active form called the "citrovorum factor" (CF). A synthetic material of similar structure and properties is called folinic acid. The natural factor CF is about twice as active physiologically as the synthetic form. Since the CF or folinic acid seems to be the functional form of folacin, the physiologic significance of the three cannot be distinguished except on a quantitative basis None of these factors is as effective as vitamin B_{12} in the treatment of true pernicious anemia

Food Sources. The presence of this group of factors in green leaves was the basis for the names folacin and folinic [illegible]

presence in green leaves, these factors are found in liver, yeast, meats and fish, nuts, legumes and whole grains.

Pantothenic Acid

Physiologic Significance. Pantothenic acid is another of the vitamin B complex group first recognized as essential for rats, dogs, pigs, pigeons and chicks The complete synthesis of pantothenic acid was accomplished in 1940 A deficiency of pantothenic acid has been reported to cause emaciation, loss of hair and graying of hair in dark animals, ulcers of the intestinal tract and damage to several internal organs.

It is practically certain that pantothenic acid is required in human nutrition It is a part of coenzyme A which plays a basic role in metabolism, in the utilization of carbohydrates, in the synthesis and the breakdown of fatty acids and sterols and in a number of other processes

Food Sources The name *pantothenic,* meaning widespread, indicates that the distribution of this vitamin is extensive Figures on the pantothenic acid content of foods are limited in number Yeast, liver, kidney, heart, salmon and eggs are the best sources. Other good sources are broccoli, mushrooms, pork, beef tongue, peanuts, wheat, rye and soybean flour About one half of the pantothenic acid is lost in the milling of grains, which constitute an important, if not a rich, source of this factor in the average diet. Fruits are relatively poor sources of this vitamin.

Biotin

Physiologic Significance. Biotin, another member of the vitamin B complex, was first isolated in 1936 as a growth essential for yeast.

Previous to this date numerous workers had described factors called by various names but having similar antidermatitis properties These several factors proved to be identical and are now known as biotin. Investigations have shown that a biotin deficiency can be produced in rats, rabbits and monkeys by feeding a substance called avidin found in raw egg white. Avidin inactivates biotin and is known as an antivitamin (*see* last paragraph in the chapter). Intestinal synthesis of biotin is common in most animals and possibly in man. There is some evidence, however, that biotin is needed by man because deficiency symptoms have been produced by feeding raw egg white [4]

Food Sources. Few foods have been analyzed for this factor. It is abundant in liver and other organs, in yeast, mushrooms and peanuts Lesser amounts occur in milk, eggs and certain vegetables and fruits.

Other B Complex Factors

Para-aminobenzoic Acid (PABA)

Para-aminobenzoic acid was first recognized as a vitamin in 1941 As a vitamin it is necessary for growth and maintenance of normal fur in rats and for the prevention of the graying of fur in dark-colored rats. PABA seems to have a specific enzymatic function in the metabolism of certain amino acids. It is widely distributed in plant and animal foods and is especially high in liver and yeast.

Inositol

Inositol was first considered to be a vitamin in 1940, although it had been known for decades as a carbohydrate substance similar to glucose chemically and with a sweet taste.

A deficiency of inositol was noted first by poor growth and loss of hair in experimental mice. The biochemical function seems to be related in some way to fat metabolism and the prevention of lipoid deposits The significance of inositol in human nutrition has not been established

Food sources of inositol are fruits, vegetables, whole grain and organ meats. It occurs in plants as a phytin derivative, an organic phosphorus compound found in grains.

Choline and Betaine

The classification of these 2 nitrogenous compounds as vitamins is questioned by some because they may be structural components of body cells rather than catalysts. Choline occurs in foods as well as in the body in relatively large amounts and has never been associated with a deficiency disease in man. The body can make choline from methionine, an amino acid, with the aid of vitamin B_{12} and folacin. The action of choline, betaine or methionine in the prevention of "fatty livers" is known as lipotropic (fat moving). Choline is distributed widely in plant and animal tissues, and a deficiency is not likely in the average diet Betaine is formed by the oxidation of choline

Six or seven other fractions of the B complex have been described as essential for growth or protection against specific lesions in experimental animals, but as yet they have not been accepted generally. Nothing is known of their human significance. If an adequate intake of the better-known B complex vitamins is derived from natural sources, it can be assumed that those less well known are apt to be present. The confusion that accompanies the discovery of most new vitamins until their identity has been well established need not concern the average reader of this text.

[4] Sydenstricker, V. P., *et al.*: J.A.M.A. 118.1199, 1942

Water-Soluble Vitamins

	C	Fractions of the Vitamin B Complex					
Active Chemical Forms	Ascorbic Acid	Thiamine (B_1)	Riboflavin (B_2)	Niacin and Niacinamide (Precursor Tryptophan)	Pantothenic Acid	Vitamin B_6, Pyridoxine, Pyridoxal, Pyridoxamine	Biotin, Folacin B_{12}, Inositol, Choline, PABA
Important food sources	Citrus fruits Strawberries Cantaloupe Tomatoes Sweet peppers Cabbage Potatoes Kale, parsley Turnip greens	Pork Liver Organ meats Whole grains Enriched products Nuts Legumes Potatoes	Liver, milk Meat, eggs Enriched products Green, leafy vegetables	Liver, poultry Meat, fish Whole grains Enriched products Legumes Mushrooms	Liver Organ meats Eggs, peanuts Legumes Mushrooms Salmon, whole grains	Pork Organ meats Legumes, seeds Grains Potatoes Bananas	Liver Organ meats Some in leafy vegetables
Concentrates or pharmaceutical sources	Synthetic	Yeast, wheat germ, extracts Synthetic	Yeast Liver concentrates Synthetic	Yeast Liver concentrates Synthetic	Yeast, wheat germ, liver concentrates	Yeast, wheat germ, liver concentrates	Yeast concentrates
Stability to cooking, drying, light, etc.	*Unstable to heat* and oxidation, except in acids Destroyed by drying and aging	Unstable to heat and oxidation	Stable to heat in cooking, to acids and oxidation Unstable to light	Stable to heat, light and oxidation, acid and alkali	Unstable to acid, alkali, heat and certain salts	Stable to heat, *light and oxidation*	Variable stability to heat, *light*, acid and alkali
Function: Essential in	Formation of intercellular substance, cellular oxidation and reduction	Carbohydrate metabolism, component of tissue enzyme cocarboxylase	Carbohydrate & amino acid metabolism, component of enzyme system	Carbohydrate & amino acid metabolism, component of enzyme system	Growth and health of all animals Active as coenzyme A	*Metabolism of* fats and amino acids	*Growth*, cell respiration, blood formation, fat metabolism
Deficiency manifest as	Scurvy Sore mouth Sore and bleeding gums *Weak-walled capillaries*	Beriberi (man) Polyneuritis (animals) Poor appetite *Fatigue* Constipation	Eye sensitivity Cataract Cheilosis (man) Alopecia (rats)	Pellagra (man) Blacktongue (dogs)	Dermatitis (chicks) Graying of hair (rats)	Acrodynia (rats) Microcytic anemia (dogs)	Stunted growth and/or metabolic disturbances
Adult human requirement	Men 75 mg Women 70 mg.	Men 1.3-1.6 mg Women 1.0-1.2 mg	Men 1.8 mg. Women 1.5 mg	Niacin equivalent Men 18-21 mg. Women 17 mg	Not yet established	Probably 2-3 mg for adults	Unknown

ANTIVITAMINS

Research in the chemical structure of the vitamins has led logically to knowledge of their characteristic reactions. In many instances a change in chemical composition, such as oxidation, completely destroys the vitamin activity In other instances another compound may react with a vitamin in such a way as to inactivate it without actually destroying it. Such a substance is sometimes called an antivitamin. One example of an antivitamin is avidin, found in raw egg white Avidin reacts with biotin to form a compound which cannot be absorbed from the intestinal tract. When experimental animals are fed raw egg white, a biotin deficiency develops. Another type of antivitamin is a compound so similar to the vitamin in structure that it starts to react as does the vitamin but cannot finish the reaction Thus, the function which the vitamin is meant to perform cannot be accomplished.

Antibiotics and, possibly, some of the sulfa drugs used in the treatment of infections may be vitamin antagonists. Normally, bacteria in the intestinal tract have the ability to synthesize certain vitamins When a sulfa drug or an antibiotic (a substance which destroys micro-organisms) is given orally, it may kill in the intestinal tract some of the bacteria capable of vitamin synthesis. Quite the opposite effect has been noted in some experiments on animals, in them, the antibiotics stimulate growth, possibly by destroying detrimental bacteria

STUDY QUESTIONS

1. From a historical point of view, which deficiency diseases were first to be recognized as such?

2. List properties and food sources of ascorbic acid. Why is this factor the most difficult to supply in army rations or for arctic expeditions?

3 How has the human need for ascorbic acid been studied? Why is a regular daily supply so essential?

4 How many fractions of the vitamin B complex are recognized today? Which ones are listed in the Recommended Dietary Allowances?

5 Which factors of the B complex are used in bread and flour enrichment? What other cereal products besides wheat are now enriched in certain localities?

6. Name the scientist largely responsible for isolating and synthesizing thiamine?

7. Do deficiencies of any of the B complex fractions still occur in the United States or other parts of the world?

8 Which vitamins are likely to be reduced in foods under following treatment

(A) Bottled milk exposed to sunlight
(B) Cabbage kept overnight after shredding
(C) Vegetables to which soda has been added in cooking
(D) Potatoes mashed and reheated

9. What is meant by an antivitamin, and how is the vitamin activity destroyed or prevented?

See Bibliography in Part Four for other pertinent material on the topics discussed in this chapter.

CHAPTER NINE

Digestion, Absorption and Cell Metabolism

Digestion and absorption often are regarded as part of the total metabolism of food in the body. While this phase of the subject already may be familiar, a brief review of digestion cannot well be omitted from a study of nutrition

ENZYME ACTION IN DIGESTION

Digestion is the process whereby foods are prepared by the various parts of the alimentary canal for absorption into the body proper. No food can function in nourishing the body tissues until it has been absorbed into the blood stream Before food can be absorbed it must undergo a series of mechanical and chemical changes that constitute digestion The chemical changes are brought about by a series of enzymes [illegible]

[illegible]

complex foodstuffs into simpler compounds. Enzyme action is specific; that is, a particular enzyme functions in the breakdown of a particular class of foodstuffs and has no action on any other. Digestion experiments performed outside the body, although not exactly duplicating body conditions, have served to demonstrate the high degree of specificity as well as the great activity of enzymes

Enzymes may digest from 500,000 to 4,000,000 times their own weight of the foodstuffs in question The enzymes are unstable at high temperatures. Most of them function best at body temperature and under the specific conditions [illegible]

[illegible]

ending -ase for example, amylases [illegible]

[illegible]

sucrase on sucrose, etc

FOOD CHANGES IN THE MOUTH

The first change in food takes place in the mouth, where it is finely divided

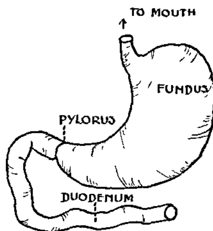


Fig 27. Stomach showing fundus where food is first held. Note the pylorus at the entrance to the duodenum.

through the process of mastication, softened, moistened and made ready for swallowing. It is moistened by becoming mixed with saliva, a fluid secreted by three pairs of glands. the submaxillary, located near the angle of the jaw; the sublingual, beneath the tongue; and the parotid, in the cheek. It has been estimated that these glands secrete about 1,500 cc. of saliva per day, a little more than 3 pints. The most active principle of the saliva is a salivary amylase—ptyalin—an enzyme that acts on starch. Ptyalin carries the digestion of the cooked starch through three or more dextrin stages down to the sugar, maltose. The possibility that maltose may be changed to glucose by a salivary maltase has been suggested by some workers However, the complete change of starch to either maltose or glucose seldom occurs in the mouth, since food remains there only a few minutes.

Swallowing is a reflex act initiated by the muscles at the base of the tongue The bolus of food is carried down the esophagus partly by gravity and partly by muscular action—a wave of relaxation followed by a wave of constriction (peristalsis), the entire process taking only a few seconds.

DIGESTION IN THE STOMACH

As the food enters the stomach it forms a mass in the fundus, the portion nearest the esophagus that serves as a reservoir for food. Here it is held for some time, variously estimated at from ½ to 2 hours, during which time little or no free hydrochloric acid mixes with it. The glands producing the acid are situated in the middle portion of the stomach. The salivary digestion of starch proceeds until such time as the food mass, which is neutral or slightly alkaline upon entering the stomach, has become permeated with the acid gastric juice The food mass in the fundus is reduced gradually in size as small portions move toward the middle portion of the stomach, where active gastric digestion proceeds.

Gastric juice is a clear liquid, the active principles of which are hydrochloric acid and the enzymes pepsin, rennin and a gastric lipase From 2,000 to 2,500 cc. of gastric juice is secreted daily Hydrochloric acid is present in the juice in about 0.4 or 0 5 per cent concentration when freshly secreted from the glands. Some of the acid is neutralized by alkaline fluids regurgitated from the small intestine Therefore, the juice as it is obtained from the stomach contains about 0 2 per cent hydrochloric acid, which is diluted still further when food is present. In abnormal conditions the acid may be increased, reduced or absent. The acid probably serves to delay or inhibit the growth of some of the micro-organisms that find entrance into the stomach along with the water and the food. This inhibiting value must not be overemphasized, because it is limited by the short time the food is in contact with the acid.

Gastric Enzymes. The gastric protease—pepsin—is formed by the action of hydrochloric acid on the inactive

STOMACH EVACUATION TIMES AND HIGHEST TOTAL ACIDITIES FOR VARIOUS ARTICLES OF DIET*

ARTICLE OF DIET (100-Gm portions unless otherwise stated)	NUMBER OF OBSERVATIONS	HIGHEST TOTAL ACIDITY (average) (cc 0 1 N alkali to neutralize 100 cc. juice)	EVACUATION TIME HOURS AND MINUTES (average)
Beef and beef products	25	120	3 00
Bread and cereals	75	80	2 40
Cakes	29	90	3 00
Chicken	20	125	3 15
Egg and egg combinations	90	80	2 40
Fish	75	130	2 50
Fruits	68	90	2 00
Gelatin (fruit-juice preparations)	5	70	2 00
Guinea hen	2	110	4 00
Ice cream	7	105	3 15
Ices	4	65	2 35
Junket	4	65	2 25
Lamb and lamb products	14	135	3 00
Licorice	1	65	3 00
Milk			
Cow			
400 cc.	50	100	2 30
75 cc	3	45	1.15
Human			
150 cc	5	60	1 40
225 cc	2	90	2 25
Nuts (25–50 Gm.)	22	100	3 30
Orange-albumen (2 1)	2	85	2 20
Pies	29	90	2 30
Popcorn	3	60	1 30
Pork and pork products	31	120	3 15
Puddings	23	90	2.20
Sugars and candies	28	70	2 05
Turkey	2	140	3 30
Veal			
(A) Market	7	140	2 50
(B) "Bob"	7	110	3.20
Vegetables prepared in different ways	124	75	2 15

* Hawk, P B, Oser, B. L, and Summerson, W H: Practical Physiological Chemistry, Blakiston, New York, 1954

form of the enzyme known as pepsinogen secreted by the gastric glands Pepsin changes proteins into the simpler forms, proteoses and peptones. This peptic action is continued for a short time after the food mass reaches the intestine. Rarely, if ever, is the quantity of pepsin insufficient for the digestion of the proteins, but the amount of hydrochloric acid secreted may be insufficient to activate the pepsinogen. Rennin, another enzyme of the [illegible]

[illegible] paring it for the further action of the protein-splitting enzymes in the intestine.

A gastric lipase may split the emulsified fats, such as are found in cream

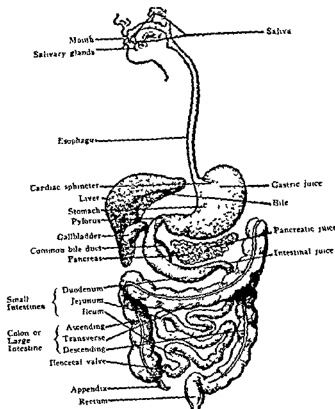


Fig 28 Diagram of digestive organs and juices, etc.

and in egg yolk, to fatty acids and glycerol.

How Foods Leave the Stomach

Peristaltic waves, the rhythmic contractions of the alimentary tract, which originate at the transverse band near the middle of the stomach, carry the food on toward the pylorus, which in turn finally permits it to pass on into the intestinal tract. Water leaves the stomach rapidly, in ½ hour or less, partly through a relaxed pylorus and partly by absorption directly from the stomach into the blood stream Foods leave more slowly, the emptying time of the stomach varying with the individual and with the amount and the nature of the meal. Small amounts of food may leave the stomach in from 1 to 4 hours, while the last remnant of a full-sized meal may not have disappeared in 6 or 7 hours Carbohydrates taken alone leave the stomach more rapidly than protein, and protein more rapidly than fat alone, but mixtures apparently leave more slowly than their single food constituents

The Pylorus. When the food has become thoroughly mixed with the gastric juice, the pylorus, a strong sphincter muscle—gatekeeper of the stomach—

Summary of Digestive Juices and Their Enzymes

(See diagram on opposite page)

Digestive Juice	Enzymes Present	Reactions Promoted
Salivary	Amylase (ptyalin)	Starch → maltose
Gastric	Protease (pepsin) Lipase Rennin Hydrochloric acid (not an enzyme)	Protein → proteoses and peptones Emulsified fats → fatty acids and glycerol Aids in the digestion of milk (casein) Activates pepsinogen
Pancreatic	Amylase (amylopsin) Protease (trypsin) Lipase (steapsin) Maltase	Starch → maltose Protein → peptides and amino acids Fats → fatty acids and glycerol Maltose → glucose
Intestinal	Peptidases Disaccharidase: sucrase Disaccharidase: maltase Disaccharidase: lactase	Peptides → amino acids Sucrose (cane sugar) → glucose and fructose Maltose → glucose (2 molecules) Lactose → glucose and galactose
Bile		Aids in digestion and absorption of fats by emulsification

opens more frequently, and the walls of the stomach contract more vigorously so as to force the semifluid food material out into the duodenum. This material is known as chyme. The presence of acid in it causes the intestinal mucous membrane to secrete into the blood stream a substance called secretin, which in turn stimulates an outpouring of the pancreatic juice into the duodenum

DIGESTION IN THE SMALL INTESTINE

Intestinal Juices. In the small intestine the food is mixed with other digestive juices, which are capable of acting upon all three of the principal food constituents, namely, carbohydrates, fats and proteins The pancreatic juice, secreted by the pancreas, and the bile, secreted by the liver, are poured into the duodenum, a short distance beyond the pylorus, where they mix with the chyme They are all alkaline, and their first action is to neutralize the hydrochloric acid and other acids of the food mass

Pancreatic Enzymes in the Intestines. The enzymes in the pancreatic juice include a protease (trypsin), an amylase (amylopsin), a lipase (steapsin) and maltase Trypsin, activated by the intestinal juice, continues the digestion of proteoses and peptones or initiates the breakdown of proteins that may have escaped peptic digestion in the stomach. Trypsin is the most powerful proteolytic enzyme and may carry the splitting process to the amino acid stage.

Amylopsin from the pancreas continues the digestion of any starches that may not have been carried to the maltose stage by the action of ptyalin in the saliva. Even raw starches may be digested by this enzyme. The pancreatic maltase acts on maltose, changing it into glucose

Bile and Lipase. The bile secreted by the liver is stored temporarily in the gallbladder until the flow of bile into

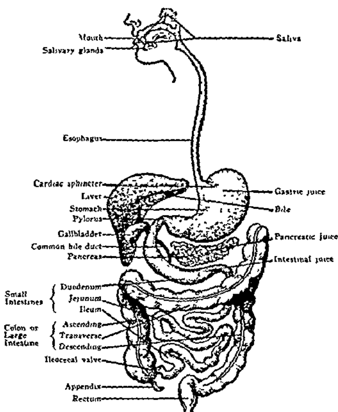


Fig 28. Diagram of digestive organs and juices, etc.

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The Pylorus. When the food has become thoroughly mixed with the gastric juice, the pylorus, a strong sphincter muscle—gatekeeper of the stomach—

lymph capillaries and then forced by muscular contraction of the villi on into the larger blood and lymph vessels of the intestinal wall

Selective Absorption. The products of protein digestion, peptides and amino acids, with the single sugars, pass through the walls of the villi into the minute blood capillaries, which in turn carry these absorption products into the portal vein and thence to the liver.

Products of fat digestion may be absorbed by either the lacteals, which are part of the lymphatic system, or by the blood capillaries, which transport nutrients direct to the portal vein and the liver During the passage through the intestinal wall the fatty acids and glycerol may unite to form neutral fat, may combine with phosphates to form phospholipids, or may form cholesterol esters or lipoproteins The finely emulsified fat which is not split by enzyme action must be absorbed via the lacteals The lymph carries these products via the thoracic duct, thence slowly into the blood stream in the left subclavian vein The portal blood carries its absorbed products to the liver for redistribution through the systemic circulation.

Passage of the food along the intestinal tract proceeds with regularity and rhythm. The acid chyme first ejected through the pylorus remains in the duodenum until a mass accumulates Segmentation of the food mass is then brought about by contractions of nonconsecutive rings of muscle at different portions of the intestinal tract. These contractions take place first at one point and then at another, thus bringing about a thorough mixing of the food with the digestive juices and aiding in absorption. Contraction and segmentation cease periodically, and the small masses of food material are carried forward by peristalsis. The food again masses together, accumulating in the lower portion of the small intestine, the ileum. Here remnants of undigested foods are allowed longer contact with the digestive juices, digestion being practically completed at this point. What remains of the semifluid mass is then passed on into the large intestine

The Ileocecal Valve. Between the small and the large intestine there is another gate, similar in function to the pylorus of the stomach, known as the ileocecal valve. The food mass passes through the ileocecal valve into the large intestine, where further absorption of fluid may take place If this valve is unimpaired, it rarely allows any of the food mass to pass back again into the small intestine, in spite of antiperistalsis in the cecum

FOOD CHANGES IN THE LARGE INTESTINE

The large intestine does not secrete any enzymes, although digestion continues here, as salivary digestion continues in the stomach due to digestive juices already mixed with the food. The large intestine fills rather slowly, and in it the food mass remains for several hours, sometimes a day or more Antiperistalsis, a reverse movement, as well as peristalsis, takes place in the anterior portion of the large intestine. This antiperistaltic movement permits the food to come into close contact with the walls of the large intestine, thus favoring absorption of water. During this time water is absorbed from the mass which gradually takes form and is finally ejected from the body as feces The feces consist chiefly of undigested- and indigestible-food materials, with some digestive juices, bacteria and cellular debris of the body tissues.

The control of water balance in the colon is extremely important, because both constipation and diarrhea are essentially problems of disturbed water balance During a day there is secreted into the digestive tract some 8,500 cc. of fluid, most of which is reabsorbed as a carrier of dissolved-food constituents. Complex osmotic pressure relations

the intestine is stimulated by the presence of food in the gut.

Fats must be emulsified first into microscopic globules before they can be digested or absorbed The bile salts in the bile are chiefly responsible for this emulsifying action, which greatly increases the surface area of the fats exposed to enzyme action The steapsin then may split a large portion of the fat to fatty acid and glycerol. The [illegible]

bile is essential for both the digestion and the absorption of fats and the fat-soluble vitamins.

Intestinal Enzymes. The intestinal juice contains several peptidases—enzymes—that carry the hydrolysis of partially digested protein to completion, breaking proteoses and peptides to amino acids. The intestinal juice completes the digestion of the carbohydrates by means of the three specific enzymes—sucrase, maltase and lactase—that split respectively sucrose (cane sugar), maltose and lactose (milk sugar) into the single sugars (glucose, fructose and galactose).

The table on page 105 shows the action of the various digestive juices upon the food constituents.

The diagram of the digestive organs should be studied along with the table on page 103.

ABSORPTION OF FOOD

With the exception of a small amount of water, no absorption of food takes place from the mouth and almost none from the stomach. By far the greater [illegible] increased by numerous fingerlike projections or processes called villi, which extend into the food mass. Each tiny villus is provided with numerous capillaries, an artery and a vein, and in the center is a lymph space called a lacteal or chyle vessel, which is a part of the lymphatic system (Fig. 29). Each villus has a muscular structure that permits expansion and contraction. Digested food material is absorbed through the walls of the villi into the blood or the



cellulose is advantageous, because of its laxative action in the colon The cellulose in foods, given as fiber in most food tables, is discussed more fully in Chapter 2, and its use in intestinal diseases is considered in Chapter 24

AVERAGE COEFFICIENTS OF DIGESTIBILITY OF FOODS WHEN USED IN MIXED DIET (CELLULOSE CONTENT NOT INCLUDED)

	PROTEIN per cent	FAT per cent	CARBOHYDRATE per cent
Animal foods	97	95	98
Cereals and breadstuffs	85	90	98
Dried legumes	78	90	97
Vegetables	83	90	95
Fruits	85	90	90
Total food of average mixed diet	92	95	98

The above table shows the completeness of digestion of various classes of foods as determined by Atwater,[2] and these figures are still used in calculations [3]

INTERMEDIARY AND CELL METABOLISM

A study of digestion and absorption of foods would not be complete without some mention of the fate of the absorbed nutrients The transport of the nutrients by the blood stream, the storage of surplus nutrients, metabolism in the cells and the role played by water in the body are all part of the picture Each of these subjects warrants more study than the brief comments possible here.

Transport and Storage of Nutrients

All of the absorbed nutrients are carried to the tissues by the blood stream All excess nutrients and end products of metabolism are carried from the tissues by the blood

The liver and the muscles store part of the sugar as glycogen, and another part may be changed to fat and along with excess fat be stored in the body as adipose tissue Amino acids, the end products of protein digestion, are allowed to proceed to the tissues where needed If they are in excess of the needs of the tissues for building or repairs, they are split into two parts One portion contains nitrogen, most of which is excreted as urea, the other portion, some of which is similar to carbohydrate, is utilized as such. The metabolism of each food constituent has been discussed in more detail in the respective chapters

Water in Relation to Body Function

Water is not changed in any way by the digestive juices, but it is a necessary constituent of them and of every cell in the body Water is even more essential to life than food Man may live weeks without food, but only days without water Two thirds of the body weight is water. About 4½ pints is eliminated every day, carrying waste material with it. This amount must be replaced in form of fluids or foods containing water.

Although some water (about ½ pint) is formed within the body as an end product of food metabolism, from 6 to 8 glasses of water or beverages should be drunk daily in order to make sure that a sufficient amount of water is available for bodily functions

Water is absorbed rapidly from the digestive tract into the blood and the lymph Enough water is retained with food residues in the colon to produce a soft stool *Water taken before breakfast* in the morning may act as a mild laxative. The laxative effect may be increased by taking water plus a small amount of salt, which delays absorption and tends to retain the water in the intestine

[2] Atwater, W. O Farmers' Bulletin No. [illegible]

determine how much is absorbed and how much left with the intestinal residue. Numerous environmental and psychic factors may interfere with the optimum amount of water being retained for normal stool formation and evacuation. According to Gauss,[1] it is one function of the bile to control the amount of water in the colon contents. Whatever the controlling mechanism may be, there is much yet to be learned about the functioning of the colon and the process of defecation

FACTORS AFFECTING DIGESTION

to the completeness of digestion. Ease of digestion is a much more indefinite term than completeness Clinically, the rate of digestion is important, however, it has been shown that food that leaves the stomach and is passed on to the intestinal tract undigested may in the end be as completely digested and absorbed as food that is wholly digested in a shorter time.

The term *digestibility*, as ordinarily

Some foods—for example, sugar—may be completely digested, but most foods leave some residue It was found by Atwater, and later by other scientists, that more than 90 per cent of the food

and fear, which may greatly retard digestion. On the other hand, joy and mirth are conducive to more normal

[1] Gauss, Harry Am J Digest. Dis 12 224, 1945

digestion. The kind of food and the method of preparation also may affect this condition. Food to which one is unaccustomed, particularly if it is unattractive, is often digested with difficulty. Thus, even when food is scarce and people are hungry, unfamiliar foods are not accepted readily.

The fineness of division of food is another factor that favors ease of digestion. The fineness of division may be brought about by mechanical means during preparation, by mashing the food or by forcing it through a sieve or a strainer, or, when eating, by thorough

quickly than more solid ones, chiefly because the digestive juices come in contact more quickly with the whole of the substances to be digested The total quantity of food material taken at one time is also significant For this reason it is imperative that persons suffering from acute illness should be fed small amounts at frequent intervals, rather than large amounts at regular meal hours.

Intestinal motility, the vigor of the peristaltic muscular action, determines the speed with which food masses and residue are moved along the alimentary canal This motility may be excessive when there is inflammation or infection, *and the result is diarrhea Constipation* may result from sluggish motility, which condition may be due to poor muscle tone. Vitamin B complex and a reasonable amount of bulk tend to promote normal motility.

Cellulose in all vegetable foods slows digestion, particularly of the proteins. It has been demonstrated that dry legumes (peas, beans and lentils) have coefficients of protein digestibility of 78 per cent, but when free of cellulose their coefficient of digestibility for protein is about as high as for animal foods, 97 per cent. However, a limited amount of

cellulose is advantageous, because of its laxative action in the colon. The cellu- [illegible]

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[2] Atwater, W O: Farmers' Bulletin No 142, U S Department of Agriculture, 1902.

[3] Merrill, A L, and Watts, B. K Energy Value of Foods, Agricultural Handbook No. 74, 1955.

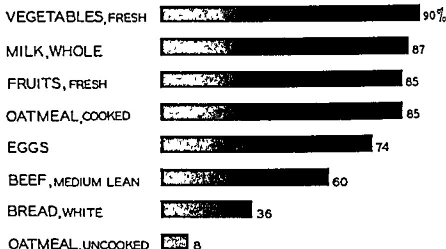


Fig 30. Percentage of water in common foods.

Water in Body Fluids. Water is essential as a component part of blood, lymph and the secretions of the body, as well as of the more solid tissues. Water is the universal medium in which the various chemical changes of the body take place As a carrier it aids in digestion, absorption, circulation and excretion, it is essential in the regulation of body temperature, it plays an important part in the mechanical functions, such as lubrication of joints and movement of the viscera in the abdominal cavity Moisture is necessary for the functioning of every organ in the body. Waste products from the tissues are transferred to the blood in watery solutions, they are carried by the blood, which is about 80 per cent water; they are excreted via the kidneys in the urine, which is about 97 per cent water (Fig. 31).

The same water is reutilized many times and for different purposes. Approximately 8 to 9 quarts (8,500 cc.) of digestive juices is produced and secreted by glands in 24 hours (Fig. 28). The water which carries the active enzymes into the digestive tract is used during absorption to carry the digested nutrients into the blood and the lymph. Over 4 quarts (4,000 cc.) of water is always circulating in the blood stream Each time a nutrient moves to or from a cell, water is the carrier. It is estimated that some 50 quarts of water cross cell membranes in 1 day In the kidney again large volumes of water carry the dissolved waste material through the capsule of the uriniferous tubules, but in passing through the tubules most of the water with some of its useful dissolved material is reabsorbed. The urine which is excreted is the concentrated water solution of the waste products.

Dehydration. The fatal results of extreme thirst and dehydration (loss of water) further emphasize the importance of water. The German physiologist Rubner states that we can lose all our reserve glycogen, all reserve fat and about one half of the body protein without great danger, but that a loss of 10 per cent of the body water is serious and from 20 to 22 per cent loss is fatal. Thirst is nature's device for ensuring an adequate water intake. Thirst is a sensation of dryness at the root of the tongue

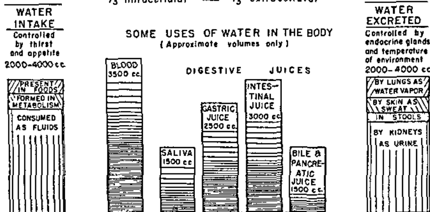


Figure 31

and the back part of the throat. Normally, thirst is experienced when breathing dry air, eating dry food, after exercise or after prolonged speaking or singing. Any circumstance that tends to increase water elimination, such as profuse sweating, hemorrhage, diarrhea or increased volume of urine, as in diabetes, will create intense thirst. The use of common salt to stimulate thirst and increase water consumption has already been discussed in Chapter 6.

Cell Metabolism

The metabolic processes within the

thesis of specific types of protoplasm for each cell, for storage and release of energy, for maintenance of blood constituents and for the elaboration of hormones and enzymes.

Cells cannot grow and multiply and perform their functions unless the necessary constituents are brought to them at all times. The cell is the vital unit of the body, and all these myriads of cell units work together as an organized

tions necessary for life, they have become specialized as to function in the higher animals, and every cell in the body is dependent upon many others for existence, i.e., for foods ready for use and for special substances such as hormones and growth substances. The cells may be compared with individuals in human society; each does its own job but depends upon others for existence.

The composition of the cells and the tissues of the body is remarkably constant, yet there is continual change or exchange of constituents. This is known as a state of dynamic equilibrium. Even the cells of such stable structures as

teeth and bone are in a state of dynamic equilibrium Conclusive proof of this has come from the use of tagged elements that could be incorporated in food fed to experimental animals and followed to their ultimate destination in the body tissues. Heavy hydrogen and heavy carbon have molecular weights one more than the usual elements and can be detected by suitable instruments even in living tissue Physiologically, they behave the same as the regular elements as constituents of organic compounds in the body. Radioactive minerals, such as iron, iodine, calcium and phosphorus, have been used as tagged elements in the study of mineral metabolism and have verified the theory that mineral compounds, both in hard and in soft tissues, are in a constant state of change.

Thus, for all cell metabolism it is obvious that the necessary materials must be available from the blood and the lymph, and must be replenished continually

constituents. The body is frugal indeed regarding the waste of essential materials and provides for their utilization again and again, as in the case of iron

the first step in the chain of events that must take place before food becomes body tissue.

STUDY QUESTIONS

1. Draw a diagram of the digestive tract and state the function of each part.

2. Name the digestive enzymes, the site of production, the action of each and the end products of digestion.

3. Digestive enzymes function best at body temperature. How would freezing or boiling temperatures affect enzyme action?

4. If you desired to demonstrate a proteolytic enzyme that would attack protein and break it all the way to amino acid, which would you choose?

5. If gastric digestion is slow or incomplete, would it be likely to be due to insufficient pepsin, rennin or hydrochloric acid?

6. Why would a diet of bread and vegetables create the sensation of hunger more than an equal number of calories with some protein and fat present?

7. Certain food faddists caution against eating starches and protein at the same meal. Is there any evidence from the way the digestive enzymes work that would refute this theory?

8 In a beverage containing milk, sucrose, glucose, salt, iron and vitamins, which factors would need digestion before absorption?

9. If the flow of bile is insufficient, which enzymatic action is most likely to be hindered?

10. If the cecum is full, will the resulting pressure on the valve tend to keep it open or closed? Explain your answer.

11. If water in the body is not sufficient for metabolic needs, what makes a person aware of this particular need?

12 Compare the rate of absorption of fats and sugars How would this difference affect the rate at which these foodstuffs would reach the blood and the tissues?

13 What is meant by a state of dynamic equilibrium in the body? What new research device has helped to prove this theory?

See Bibliography in Part Four for other pertinent material on the topics discussed in this chapter.

Estimation of Human Dietary Needs
Caloric Allowances
Interpretation and Use of Tables
Meal Planning To Fit Personal and Family Needs
Menus and Market Order
Economy Hints
Avoid Food Fads and Fallacies

CHAPTER TEN

Meal Planning To Meet Recommended Allowances

In the preceding chapters we have discussed the various nutrients needed by our bodies and have referred frequently to the Recommended Dietary Allowances. In this chapter we shall make application of the information gained in the preceding chapters The establishment of a yardstick of good nutrition by which to measure progress toward that goal has long been recognized by scientists as desirable With such a goal set for some of the most essential nutrients it is possible to interpret this goal in terms of common foods.

ESTIMATION OF HUMAN DIETARY NEEDS

The idea of setting up standards for planning family meals and food supplies is not new. Some early estimates were based upon what people actually were eating, not upon what they needed.

Even after needs were recognized, many years had to elapse before methods were developed for quantitative assays. Criteria were gradually developed for recognizing early deficiencies and distinguishing between minimum requirements and optimum allowances desirable The student should appreciate the decades of labor by thousands of research workers that have made possible the present-day estimates of dietary recommendations.

In 1933 some attempts were made to define human requirements for specific nutrients, first by the British Medical Association and later by Stiebeling and co-workers in the United States Department of Agriculture The standards formulated by the League of Nations Health Committee in 1935 were the first to represent group opinion and were based on the limited information then available.

When the Food and Nutrition Board was appointed by the National Research Council in 1940, it undertook as one of its most important projects the formulation of a set of figures for human requirements in terms of specific nutrients. As a result of long and careful consideration, Recommended Dietary Allowances

were first published in 1941. Since that date they have been revised several times as new research data became available[1] The objectives are stated as follows in the 1958 edition:

These allowances are designed to maintain good nutrition in healthy persons in the United States under current conditions of living and to cover nearly all variations of requirements for nutrients in the population at large. They are meant to afford a margin of sufficiency above minimal requirements and are therefore planned to provide a

ease or for nutrient repletion in severely depleted persons On the other hand,

body, in the range of requirement among individuals, in the difficulty of assessing precise requirements, and in possible hazards of excessive intake of some nutrients. . .

Patterns of food consumption in the United States permit ready adaptation *and compliance with the recommendations.* . . It should be realized, however, that in using this standard for evaluation of diets, it cannot be assumed that food practices are necessarily poor or malnutrition exists because these goals of nutrient intake are not com*pletely met.*

The British and the Canadian committees working independently arrived at somewhat lower figures for certain nutrients than the United States and a slightly different philosophy of interpretation *Thus, the British recom*mendations are believed to be sufficient to maintain good nutrition for the average individual rather than "higher than average" as *in the United States. The* Canadian standard represents a minimum for each nutrient or a probable physiologic requirement below which maintenance of health could not be assumed.

The Recommended Dietary Allowances as adopted by the U. S. Food and Nutrition Board are expressed in nutrients rather than specific foods because these goals can be attained from a variety of different food patterns The sample menus given on pages 120 and 121 show two patterns of eating which approximate the recommended allowances. Many cultural patterns exist in the United States and other countries, and it would be enlightening for students from other cultures to see how well their dietary pattern could serve to provide the nutrients recommended and what minor changes might be needed for improvement.

CALORIC ALLOWANCES

The Food and Nutrition Board in the United States has used a system similar to that of the FAO for estimating caloric requirements. Thus, the reference man and woman are defined as 25 years old, living in a temperate climate and weighing 70 and 58 Kg. (154 & 128 lbs), respectively:

These standard persons are presumed to be fairly active physically, being neither sedentary nor engaged in hard physical labor as a major occupation. The man could be employed in light industrial work; he could be a delivery man, a painter, an outdoor salesman, or a farmer except in the periods of heaviest farm work The woman could be employed at bench work in a factory, she could be a shop saleswoman, or an active homemaker and mother. Both man and woman are presumed to engage in a moderate amount of outdoor activity and to lead a vigorous healthy life. The allowances of 3,200 and 2,300

[1] Recommended Dietary Allowances, Revised 1958 National Research Council, Washington, D C, Pub. 589.

CALORIE ALLOWANCES FOR INDIVIDUALS OF VARIOUS BODY WEIGHTS AND AGE
(At mean environmental temperature of 20° C and assuming moderate physical activity)

MEN					WOMEN				
DESIRABLE WEIGHT		CALORIE ALLOWANCES			DESIRABLE WEIGHT		CALORIE ALLOWANCES		
Kg	Lbs	25 Yrs	45 Yrs	65 Yrs	Kg	Lbs	25 Yrs	45 Yrs	65 Yrs.
50	110	2,500	2,350	1,950	40	88	1,750	1,650	1,400
55	121	2,700	2,550	2,150	45	99	1,900	1,800	1,500
60	132	2,850	2,700	2,250	50	110	2,050	1,950	1,600
65	143	3,000	2,800	2,350	55	121	2,200	2,050	1,750
70	154	3,200	3,000	2,550	58	128	2,300	2,200	1,800
75	165	3,400	3,200	2,700	60	132	2,350	2,200	1,850
80	176	3,550	3,350	2,800	65	143	2,500	2,350	2,000
85	187	3,700	3,500	2,900	70	154	2,600	2,450	2,050
					75	165	2,750	2,600	2,150

calories, respectively, appear to be satisfactory for this "standard" man and "standard" woman Adjustments on the basis of described characteristics for age, body size, climate, and activity are indicated when individuals differ from the standard man and woman.

The above table gives the approximate caloric needs adjusted to age and desirable weight for 3 age groups

Adjustment for *activity* is not simple The adult allowances assume a moderate degree of activity. For extreme degrees of activity the allowance may be increased as much as 50 per cent For truly sedentary people the allowance must be reduced, perhaps as much as 25 per cent. The table of energy expenditures for different conditions of muscular activity given on page 50 provides a basis for approximating the caloric needs.

For a more extensive discussion of the scientific basis for calculating caloric requirements and for other nutrients listed [illegible] 3 per cent increase for every 10° C. drop in mean external temperature from the 20° C. as given. This *adjustment is* intended for differences in mean annual temperature but may serve also for seasonal differences

Adjustment of calories for *pregnancy* and lactation, and for children and adolescents, are given in the tabular recommendations.

INTERPRETATION AND USE OF TABLES

The specific nutrients included in the table of allowances and the quantities of each specified were chosen by experts in the field and are the most nearly accurate estimates possible at the date of publication.

Nutrients not listed in the tabulation are those which are apt to be present in adequate amounts in the usual dietary, or they are trace elements or vitamins for which there are insufficient data to serve as a basis for recommendation These have been discussed in the respective chapters dealing with specific nutrients.

The recommended allowances for adults are given in terms of a reference man and reference woman as described in the section on calories *Adjustment* should be made for persons who differ from the standard in body size, age or

Food and Nutrition Board, National Research Council, Recommended Daily Dietary Allowances, Revised 1958*
Designed for the Maintenance of *Good Nutrition* of Healthy Persons in the U.S.A.
(Allowances are intended for persons normally active in a temperate climate.)

	Age (Yrs)	Weight Kg	Weight (Lbs)	Height Cm	Height (In.)	Calories	Prot (Gm.)	Calc. (Gm.)	Iron (Mg.)	Vit A (I U.)	Thiam (Mg)	Ribo. (Mg.)	Niacin (Mg. Equiv.§)	Asc Acid (Mg)	Vit. D (I.U.)
Men	25	70	(154)	175	(69)	3,200†	70	0.8	10	5,000	1.6	1.8	21	75	
	45	70	(154)	175	(69)	3,000	70	0.8	10	5,000	1.5	1.8	20	75	
	65	70	(154)	175	(69)	2,550	70	0.8	10	5,000	1.3	1.8	18	75	
Women	25	58	(128)	163	(64)	2,300	58	0.8	12	5,000	1.2	1.5	17	70	
	45	58	(128)	163	(64)	2,200	58	0.8	12	5,000	1.1	1.5	17	70	
	65	58	(128)	163	(64)	1,800	58	0.8	12	5,000	1.0	1.5	17	70	
	Pregnant (second half)					+ 300	+20	1.5	15	6,000	1.3	2.0	+3	100	400
	Lactating (850 ml. daily)					+1,000	+40	2.0	15	8,000	1.7	2.5	+2	150	400
Infants‡	0–1 mo ‡														
	1–6 mos	6	(13)	60	(24)	Kg × 120	‡	0.6	5	1,500	0.4	0.5	6	30	400
	7–12 mos	9	(20)	70	(28)	Kg. × 100	‡	0.8	7	1,500	0.5	0.8	7	30	400
Children	1–3	12	(27)	87	(34)	1,300	40	1.0	7	2,000	0.7	1.0	8	35	400
	4–6	18	(40)	109	(43)	1,700	50	1.0	8	2,500	0.9	1.3	11	50	400
	7–9	27	(60)	129	(51)	2,100	60	1.0	10	3,500	1.1	1.5	14	60	400
	10–12	36	(79)	144	(57)	2,500	70	1.2	12	4,500	1.3	1.8	17	75	400
Boys	13–15	49	(108)	163	(64)	3,100	85	1.4	15	5,000	1.6	2.1	21	90	400
	16–19	63	(139)	175	(69)	3,600	100	1.4	15	5,000	1.8	2.5	25	100	400
Girls	13–15	49	(108)	160	(63)	2,600	80	1.3	15	5,000	1.3	2.0	17	80	400
	16–19	54	(120)	162	(64)	2,400	75	1.3	15	5,000	1.2	1.9	16	80	400

* The allowance levels are intended to cover individual variations among most normal persons as they live in the United States under usual environmental stresses. The rcommended allowances can be attained with a variety of common foods, providing other nutrients for which human requirements have been less well defined.

† Calorie allowances apply to individuals usually engaged in moderate physical activity. For office workers or others in sedentary occupations they are excessive. Adjustments must be made for variations in body size, age, physical activity and environmental temperature.

‡ The Board *recognizes that human milk is the natural food for infants and feels that this is the best and desired procedure for* meeting nutrient requirements in the first months of life. No allowances are stated for the first month of life. Breast-feeding is particularly indicated during the first month when infants show handicaps in homeostasis due to different rates of maturation of digestive, excretory and endocrine functions. Recommendations as listed pertain to nutrient intake as afforded by cows' milk formulas and other foods given the infant when breast-feeding is terminated. Allowances are not given for protein during infancy.

§ Niacin equivalents include dietary sources of the preformed vitamin and the precursor tryptophan. Sixty mg. tryptophan equals 1 mg. niacin.

physical activity. Allowances for infants and children are given for age groups [illegible]

in each group and are for normal activity and for the weights indicated in the table. As with adults, adjustments should be made for children who differ in size and activity from the standard

The recommended allowance values of the table are for nutrients in foods as consumed and do not take into consideration prior losses in storage, cooking and serving Provision should be made for these losses in planning practical dietaries The allowances do provide for possible incomplete availability or absorption of certain nutrients, such as iron and carotene

In spite of careful explanation as to the meaning of this yardstick and how it should be used, there has been a tendency, ever since the publication of the first edition, for some enthusiastic promoters of nutrition to misuse the figures Results of dietary surveys have been interpreted carelessly in making comparisons with the recommended allowances. Sometimes the inference has been drawn that diets which failed to meet these levels were subminimum and that persons living on such diets were malnourished and likely to show signs of deficiencies. Such conclusions ignore the broad margin between optimum allowances and minimum requirements.

When the recommended allowances are used to estimate the per capita [illegible]

ished food supply, it may be impossible to meet these recommendations. In such circumstances it is essential to distinguish between standards based on good nutrition for all and more immediate consumption goals based on practical possibilities.

The problems that arose with the feeding of civil populations in liberated countries after World War II emphasized that the liberal margins of safety highly desirable in normal times might become untenable when whole nations were starving It then becomes desirable to raise the diet of as many people as possible to the minimum-requirement levels. When Americans were required, during the war, to curtail consumption of meat, cheese and fats, at no time were the restrictions such as to cut the average consumer much, if any, below recommended allowances Even if it did so for certain groups, the restrictions were well within the margin of safety provided by the allowances

In using the nutrition yardstick it is to be emphasized that the amounts of the various nutrients, with the exception of vitamin D, can be obtained through a good diet of natural foods Flour or bread should be whole grain or enriched. It is fortunate that optimum nutrition can be provided by an unlimited number of combinations of different foods Excessive use of vitamin-poor foods should be avoided, of course, and loss and waste in preparation and in serving should be kept to a minimum The translation of the allowances into sample menus to fit different localities and incomes is our immediate concern.

The basic dietary pattern outlined in Chapter 1 provides for a liberal amount of the 8 nutrients other than vitamin D with a total caloric value of only 1,300. (*See* complete calculation of the Basic Dietary, Chap. 18) Other foods chosen to suit the appetite, growth and activity needs may add substantially to these *figures*

MEAL PLANNING TO FIT PERSONAL AND FAMILY NEEDS

Various dietary patterns might be suggested that would measure up equally well to the yardstick of good nutrition.

Menu No. 1

Moderate-cost menu for moderately active woman, age 25—pattern of Northern U.S A.

Foods	Amt Gm.	Approximate Measure	Calories	Protein Gm.	Ca Mg	Iron Mg.	Vitamin A I U.	Thiamine Mg.	Riboflavin Mg.	Niacin Mg.	Ascorbic Acid Mg.
Milk	488	2 c	332	17	576	.5	780	.19	.83	.5	5
Oatmeal, cooked	100	⅔ c	63	2	9	.7		10	02	.2	
Bread, white, enriched	46	2 slices	126	4	36	8		.12	.08	1 0	
Orange juice	100	⅖ c	44	1	19	.2	190	03	.03	.2	49
Egg	54	1	77	6	26	1.3	550	.05	.14	Tr.	
Salad dressing	15	1 tbsp.	58		1	1	20	Tr	Tr.		
Large roll	57	1 large	176	5	31	1.0		.14	.09	1 3	
Prunes, stewed	100	6 prunes, 2 tbsp. juice	165	1	22	1.5	75	05	06	6	1
Cookies, butterscotch	25	2 small	120	1	11	.5	20	05	03	.3	..
Beef pot roast	75	med. serving	231	19	9	2.4		.03	.15	3 0	.
Potato, boiled	100	1 med	83	2	11	.7	20	09	03	1 0	14
Peas, canned	100	½ c.	68	5	32	2 1	670	.12	.06	1 0	8
Tomatoes, cooked	100	⅔ c.	19	1	11	6	1,050	06	.03	.7	16
Butter or margarine	42	3 tbsp	300		9		1,380				.
Pie, custard	135	⅙ of 9" pie	266	7	162	1 0	290	07	.21	.4	.
Cream	30	2 tbsp.	60	1	30	.	240		.04	.	
Sugar	12	1 tbsp.	48								.
Candy—peanut brittle	15	1 piece	66	1	6	.3	.	.01	Tr.	.8	..
Totals			2,302	73	1,001	13.7	5,285	1.16	1.80	11 0	93
Compared with recommended allowances for a woman of 58 kg. (128 lbs)			2,300	58	800	12	5,000	1.2	1.5	17*	70

* Niacin equivalents include dietary sources of the preformed vitamin and the precursor tryptophan.

Menu No. 2

Low-cost menu for a moderately active woman, age 25—pattern of Southeastern U S.A.

Foods	Amt. Gm	Approximate Measure	Calories	Protein Gm.	Ca Mg.	Iron Mg.	Vitamin A I U.	Thiamine Mg	Riboflavin Mg.	Niacin Mg.	Ascorbic Acid Mg
Corn grits, enriched, cooked	200	1 c.	102	2	2	.6		08	06	.8	
Salt pork, cooked	50	small serving	250	2		.3		09	02	.4	
Evaporated milk	50	¼ c , scant	69	3	121	.1	200	.02	.18	.1	
Molasses	60	3 tbsp.	138		174	3 6					
Turnip greens, cooked	150	1 c	45	4	388	3 6	15,900*	.09	.61*	1 0*	87*
Sweet potato, cooked	100	1 small	123	2	30	.7	7,700	.09	05	.6	20
Black-eye peas or cowpeas, cooked	100	⅔ c.	94	7	37	2 5	390*	.29	.08	.8	20*
Tomatoes, canned	100	½ c	19	1	11	6	1,050	06	03	.7	16
Corn bread, enriched	100	2 pcs , 2¼ x 3"	219	7	139	1 9	130	.17	23	1.3	
Biscuits, enriched	100	3 (2" diam)	342	8	218	1 8		.23	.22	2 0	
Buttermilk	244	1 glass	87	9	288	2		09	.43	2	2
Pork, fresh	75	1 med. serving	300	18	9	2 4		.62	.18	3 7	
Margarine	42	3 tbsp	300		9		1,380				
Peanut butter	32	2 tbsp	184	8	24	6		04	.04	5 2	
Sugar	12	1 tbsp	48								
Totals			2,320	71	1,450	18.9	26,750	1 87	2 13	16 8	145
Compared with recommended allowances for a woman of 58 kg (128 lbs)			2,300	58	800	12	5,000	1 2	1 5	17†	70

* If cooked for a long time in a large amount of water, these factors may be reduced considerably.
† Niacin equivalents include dietary sources of the preformed vitamin and the precursor tryptophan.

It is important to recognize personal, family and regional preferences when planning meals, especially for the sick. This has an important bearing also on the ultimate success of any nutrition program. When a person has a poor appetite, it is unwise to introduce unfamiliar or disliked foods. To attempt to do so

nutritionist must take pains to interpret needs in terms of favorite foods available in the particular locality, in season and suitable to the income level of the group concerned.

The first suggested menu for a moderately active woman is of moderate cost and of a type used in a large part of the United States, particularly northern and central areas. The menus for the 3 meals are suggested, and the nutritive value is calculated in tabular form on page 118 It will be noted that the food values of this menu exceed the recommended allowances in most instances.

Menu No. 1

Breakfast

Orange juice
Oatmeal
Whole milk
Toast and butter
Coffee with cream and sugar

Lunch

Egg salad
Roll and butter
Stewed prunes
Cookies
Milk
Candy snack—peanut brittle

Dinner·

Pot roast of beef
Potatoes, boiled
Stewed tomatoes
Peas, canned or frozen
Bread and butter
Custard pie
Coffee with cream and sugar

The second menu for a moderately active woman is low cost and typical of certain groups, especially in the southern part of the United States. This menu also meets the recommended allowances although it is quite different from Menu No. 1 in food items.

Menu No. 2

Breakfast:

Grits and pork gravy *or*
Corn-meal pancakes, fat pork and molasses
Coffee with evaporated milk

Lunch·

Hot biscuits
Peanut butter
Molasses
Turnip greens

Dinner:

Pork shoulder
Sweet potatoes
Tomatoes
Cowpeas or black-eye peas
Buttermilk
Corn bread and margarine

The second list of foods contains less milk, no fruit, no egg and less variety, but it measures up to recommended allowances almost as well as the first. It must be remembered that the calcium from greens may not be as readily available as that from milk, but the liberal supply allows for some not being used. Also, the larger proportion of carotene from vegetables may not be as efficient as vitamin A from animal sources, but there are several times the recommended allowance of this factor (*See* calculation on p. 119.)

Numerous other combinations could be equally adequate and adapted to available food supplies and dietary customs.

Special attention is directed to the need for adaptation to local customs when this text is used in other countries An Overseas Supplement to this text is available and is sent with every copy of

the book shipped outside North America. In this Supplement sample dietaries from Formosa, *India*, Lebanon and Puerto Rico are given as examples of [illegible] such adaptation can be made A [illegible] from vari- [illegible] calculate a day's menu [illegible] own family and locality. In so doing it will be noted that each food in such a list plays a specific role and, if omitted, has to be replaced by another of similar food value to keep the day's menu adequate. A knowledge of food equivalents makes it easier to plan for variety in meals while keeping the food value adequate

From the foods necessary for good nutrition, meals may be planned that appeal to the appetite of the individual or the family. *The 4* food groups outlined in Chapter 1 give ample opportunity for variation in the choice of foods within each group without sacrificing any food essentials.

When more money is available, the allowances for meat, fresh fruits and vegetables, butter and certain luxuries may be increased. In this case the amounts of potatoes, dried vegetables, bread and cereals may decrease automatically. The homemaker who has the responsibility of planning and preparing meals for a family of varying ages and activities, with perhaps some dietary restrictions in the group, may need some help. The nutritive requirements of children and elderly people are somewhat different from those of adults in the prime of life. It would be folly to give a small child everything that appears on the family menu However, this menu should be planned in such a way that few special foods need be prepared for him. The question of food for children is discussed in detail in Chapters 13 and 14, of course, any member of the family who is ill must have special consideration However, all diets should be planned around the family menu, as the essentials are similar for all. Therapeutic diets are discussed in Part Two.

Suggested Market Order for a Week

For family of 2 adults and 2 children (8 & 10 years old)

Leafy, green and yellow vegetables
- 1 head lettuce
- 2 lbs snap beans
- 2 bunches carrots
- 2½ lbs spinach
- 2 lbs squash
- 1 head of cabbage (small)
- 1 No 2 can or 1 pkg frozen green peas
- 1 pkg green Lima beans (frozen)

Citrus fruit, Tomatoes
- 4½ to 5 lbs. oranges or 2 cans frozen orange juice
- 2 grapefruit
- 1 46-oz can tomato juice
- 1 large can tomatoes

Potatoes, Sweet Potatoes
- 2 lbs sweet potatoes
- 6 lbs potatoes

Other Vegetables and Fruit
- 2 lbs apples
- 3 lbs other fruit in season or canned
- 1 No. 2½ can peaches
- 1 lb. prunes
- ½ lb raisins
- 1 bunch celery
- 1 lb onions

Milk, Cheese, Ice Cream
- 15 qts fresh whole milk
- 1 14½-oz can evaporated milk
- 2 lbs nonfat dry milk solids
- ½ lb Cheddar cheese
- ½ to 1 lb cottage cheese
- 1 pt. ice cream

Meat, Poultry, Fish
- 3 to 3½ lbs chuck roast of beef
- 2 to 3 lbs shoulder of lamb
- 1 lb. liver
- 1 lb fish (haddock, cod, halibut)
- 1 can tuna or salmon

Eggs
- 2 doz.

(*Continued*)

It is important to recognize personal, family and regional preferences when *planning meals, especially for the sick.* This has an important bearing also on the ultimate success of any nutrition program When a person has a poor appetite, it is unwise to introduce unfamiliar or disliked foods To attempt to do so [illegible]

[illegible]

nutritionist must take pains to interpret needs in terms of favorite foods available in the particular locality, in season and suitable to the income level of the group concerned.

The first suggested menu for a moderately active woman is of moderate cost and of a type used in a large part of the United States, particularly northern and central areas The menus for the 3 meals [illegible]

[illegible]

this menu exceed the recommended allowances in most instances

Menu No. 1

Breakfast

Orange juice
Oatmeal
Whole milk
Toast and butter
Coffee with cream and sugar

Lunch·

Egg salad
Roll and butter
Stewed prunes
Cookies
Milk
Candy snack—peanut brittle

Dinner:

Pot roast of beef
Potatoes, boiled
Stewed tomatoes
Peas, canned or frozen
Bread and butter
Custard pie
Coffee with cream and sugar

The second menu for a moderately active woman is low cost and typical of *certain groups, especially in the southern* part of the United States. This menu also meets the recommended allowances although it is quite different from Menu No. 1 in food items.

Menu No. 2

Breakfast:

Grits and pork gravy *or*
Corn-meal pancakes, fat pork and molasses
Coffee with evaporated milk

Lunch

Hot biscuits
Peanut butter
Molasses
Turnip greens

Dinner:

Pork shoulder
Sweet potatoes
Tomatoes
Cowpeas or black-eye peas
Buttermilk
Corn bread and margarine

The second list of foods contains less milk, no fruit, no egg and less variety, but it measures up to recommended allowances almost as well as the first. It must be remembered that the calcium from greens may not be as readily available as that from milk, but the liberal [illegible]

[illegible]

as vitamin A from animal sources, but there are several times the recommended allowance of this factor. (*See* calculation on p. 119.)

Numerous other combinations could be equally adequate and adapted to available food supplies and dietary customs

Special attention is directed to the need for adaptation to local customs when this text is used in other countries. An Overseas Supplement to this text is available and is sent with every copy of

TUESDAY

Breakfast

Grapefruit
Soft-cooked eggs
Toast and butter or margarine
Milk for children
Coffee or tea for grownups

Lunch

Baked macaroni and cheese
Snap beans
Shredded raw carrots
Bread and butter or margarine
Oatmeal and prune pudding (oatmeal left from Monday breakfast)
Milk

Dinner

Broiled liver and bacon
Baked potato
Baked squash
Tossed green salad
Bread and butter or margarine
Fruit in season
Milk

WEDNESDAY

Breakfast

Orange or orange juice
Ready-to-eat cereal with milk
Toast and butter or margarine
Preserves
Milk for children
Coffee or tea for grownups

Lunch

Split pea soup
Apple, cabbage and raisin salad
Bread and butter or margarine
Baked Indian pudding
Milk for children
Coffee or tea for grownups

Dinner

Beef hash with potatoes (beef left from Sunday)
Homemade vegetable relish
Creamed carrots and peas
Celery
Bread and butter or margarine
Fruit cup
Milk

THURSDAY

Breakfast

Tomato juice
Hot oatmeal with milk
Toast and butter or margarine
Milk for children
Coffee or tea for grownups

Lunch

Creamed eggs on toast or
Soft-cooked eggs with toast
Jellied fruit salad
Molasses cookies
Milk

Dinner

Baked shoulder of lamb
Baked sweet potato
Green Lima beans
Cole slaw
Bread and butter or margarine
Canned peaches
Graham crackers
Milk

FRIDAY

Breakfast

Orange
Hot wheat cereal with raisins and milk
Toast and butter or margarine
Milk for children
Coffee or tea for grownups

Lunch

Cream of pea soup
Cottage cheese and peach salad
Bread and butter or margarine
Cookies
Milk for children
Coffee or tea for grownups

Dinner

Baked fish (haddock, cod or halibut)
Sliced beets
Baked potato
Celery
Bread and butter or margarine
Lemon snow with custard sauce
Milk for children
Coffee or tea for grownups

Dry Beans, Peas, Nuts
- 8 ozs split peas
- 4 ozs. peanut butter

Flour, Cereals, Meal, Baked goods
- 3 loaves enriched bread
- 3 loaves whole-wheat bread
- 1 loaf rye bread
- 1½-lb. box rolled oats or whole-wheat cereal
- 1 pkg. ready-to-eat cereal
- 2 lbs enriched flour or corn meal
- ½ lb macaroni or spaghetti
- 1 box graham or other crackers

Fats, Oils
- ½ lb. bacon
- 1½ lbs. butter or margarine
- ½ lb shortening
- ½ pt salad dressing or salad oil

Sugar, Syrup, Preserves
- 2 lbs sugar
- ½ to 1 pt. molasses, honey, jelly or preserves

MENUS AND MARKET ORDER FOR A FAMILY OF FOUR

The choice of foods should be made according to season and should take into account taste preferences of all the members of the family.

This hypothetical family of 4—2 adults, a 6-year-old boy and a 10-year-old girl—was chosen as an illustration. The husband, of average height and weight, is moderately active, walks to work and usually comes home for lunch. The wife is of slight build but very active, doing all her own housework and caring for 2 small children She probably would need less food than her husband. The younger child would be in the second age group given in the table of allowances, the 10-year-old in the fourth group. The specific needs for children *at different ages are discussed in Chap-*

Suggested Menus for a Week for a Family

(See market order on page 121)

Sunday

Breakfast

Orange juice
Scrambled eggs
Toast and butter or margarine
Preserves
Milk for children
Coffee or tea for grownups

Dinner

Pot roast with carrots, potatoes and onions
Chopped spinach
Bread and butter or margarine
Two-egg sponge cake with ice cream
Milk for children
Coffee or tea for grownups

Supper

Open-face grilled cheese and bacon sandwich for grownups
Hot wheat cereal with milk for children
Shredded cabbage and raisin salad
Fruit in season
Milk

Monday

Breakfast:

Prunes with orange slices
Hot oatmeal with milk
Toast and butter or margarine
Milk for children
Coffee or tea for grownups

Lunch

Cream of tomato soup with toast squares
Tuna fish and celery salad
Bread and butter or margarine
Baked Indian pudding
Milk

Dinner:

Beef casserole with mounds of mashed potatoes (beef left from Sunday roast)
Green peas
Fruit salad
Bread and butter or margarine
Sponge cake with honey sauce
Milk

butter for both cooking and table use. Cream is an expensive food. For economy, top milk may be used if adequate provision is made for the children to have their full quota of whole milk. Sometimes evaporated milk may be used in place of cream. Inexpensive cheese is as good a source of protein as more expensive or processed types.

Meats, Poultry, Fish and Eggs. Cheaper cuts of meat may be used when it is necessary to cut food costs. A rough estimate of the cost of the edible portion of some of the apparently cheapest cuts may disclose that the cheapest food is not always the cut which has the lowest price tag per pound. Variety meats, such as pork or lamb liver, pork heart and beef tongue, are often good buys, both for protein and vitamins. As a rule, fish is cheaper than meat and is a good source of protein. Poultry today is less expensive per pound than good-quality meats, but the proportion of bone is large. When meats are high, main dishes of beans or peas may be used occasionally and peanut butter for sandwiches. Grade B eggs are as nutritious as Grade A and usually are cheaper. Eggs of graded size show considerable variation in price—sometimes small eggs are the best buy, sometimes large ones. Fat from bacon and other meats can be saved and used for many cooking purposes.

Bread, Cakes and Cereals. In general, foods prepared at home are less expensive than foods purchased ready to eat. Sweet rolls, buns, coffee cakes are expensive types of bread. Breakfast cereals cooked at home are cheaper than the ready to eat, but the latter are preferred by many. Large-size packages are economical for big families, but not for small ones, as the opened package may become stale and have to be discarded.

AVOID FOOD FADS AND FALLACIES

Food fads are still with us in spite of much that has been written warning people not to be misled. To quote a recent bulletin.[2]

As our scientific knowledge of nutrition has increased, food fads and nutritional quackery have increased, too. People have become increasingly aware of the importance of the right food for good health, and the quacks and faddists have seen a chance to capitalize on this situation. They use it to promote their ideas and sell their products. It is estimated at least 10 million people in the United States are influenced by dietary fads.

There are many dietary fads which may be harmless but senseless. Too often they detract from the pleasure of eating, an important element in good nutrition. Variety is in itself a safeguard, and, when variety is severely limited, as it is by some fads and self-imposed restrictions, certain nutritive factors are apt to be low or absent. Nor is there magic in any specific food item. It makes little difference whether one obtains his nutrients from fluid milk or milk powder, from milk products such as cheese, yoghurt or ice cream, or whether he gets them from meat, fish or fowl, wheat germ, whole grains or blackstrap molasses. The essential point is to get an adequate supply of each nutrient from food which tastes good. The Mexican, the Greek and the Italian each may prefer his native foods, irrespective of nutritive value. Surprisingly enough, native dietary patterns often provide nutrients which meet recommendations as well as the typical American patterns and far better than the fad diets consumed by some native Americans.

The futile efforts to cure chronic ailments, to improve the state of affairs by pseudoscientific devices, reflect a striving for something better in terms of health. It is easy to listen to misleading radio advertising, to read unreliable health literature, to follow suggestions

[2] Cook, C. M., and Foley, M. E.: Food Facts and Fads. Leaflet No. 308, Coop. Ext. Service, Univ. of Mass., 1957.

SATURDAY

Breakfast

Tomato juice
Ready-to-eat cereal with milk
Toast and butter or margarine
Preserves
Milk for children
Coffee or tea for grownups

Lunch

Peanut butter and celery sandwiches
Vegetable salad
Floating island or junket
Milk for children
Coffee or tea for grownups

Dinner

Minced lamb on rice potatoes
(lamb left from Thursday dinner)
Snap beans
Hearts of lettuce with dressing
Hot applesauce on Graham crackers with custard sauce
Milk

A 6-oz serving of milk is allowed for the children. If the children do not drink all their milk, they have it as part of the afternoon snack

ter 14. Most of the time the same meals may be planned for all the family Certain modifications can be made for the children when the adults prefer a dessert or other dish which is not suitable for children. It is simpler for the homemaker if the adults adjust their food habits somewhat to those of the children

The suggested menus for a week and a market order to provide the necessary items for this family of 4 are given in this chapter. It is suggested that each student plan menus and a market order for her own family or a family group that she knows intimately. This experience allows taste preferences and individual needs to be taken into account.

ECONOMY HINTS

Modifications in the menus and the market order may be made when it is necessary to reduce costs. Intelligent adjustments can ensure that meals are still nutritionally adequate and acceptable to the family.

Fruits and vegetables in season and when plentiful are better nutritionally and usually cheaper than canned or frozen However, home-frozen foods are good economy if home produced, and they can be prepared to suit family tastes. They may be even better if they are frozen properly and used promptly after thawing. As a rule, carrots and cabbage are inexpensive and can be used raw or cooked. Fresh greens in season and wild greens in some areas may be used in place of more expensive green vegetables Canned fruits and vegetables can replace fresh products when these are expensive or out of season. Canned tomatoes are cheaper and often higher in vitamin C than raw tomatoes out of season. During some seasons either canned or frozen orange juice is cheaper than fresh and has about the same nutritive value. Sectioned or sliced orange provides more nutritive value than the juice extracted from the same orange. Canned tomatoes or tomato juice, canned grapefruit juice and low-cost fresh fruits may be used in place of orange juice.

The nutritive value of cheaper standard grades of canned fruits and vegetables is essentially the same as that of the more expensive fancy grades, and they are canned under equally sanitary conditions

Milk and Dairy Products. Either evaporated or dried milk is cheaper than fresh milk and is entirely satisfactory for cooking Both products have some use as a beverage When dry skim milk (fat-free milk solids) is used in place of whole milks, some source of vitamin A, such as more generous amounts of green or yellow vegetables or fortified margarine, should be used Practically all margarine on the market today has the vitamin A value of average butter and is entirely satisfactory as a substitute for

Trade Commission, the United States postal authorities, Better Business Bureaus, state and national health associations, and the American Medical Association through its Bureau of Investigation and Council on Foods and Nutrition But there are ways of evading any law or regulation There will always be quacks and promoters who want to sell something There will [illegible]

theories Money spent for better food—more of the protective foods—will go farther toward promoting better health for America than the same amount of money now being spent for pseudo-health and diet fads

STUDY QUESTIONS

1. The Food and Nutrition Board of the National Research Council has recommended dietary allowances for certain specific nutrients. Which ones are listed in this table?

2 These allowances are listed for different age and sex categories For which of these are the allowances as great for young children as for a grown man? Why?

3. For which factor do the allowances vary directly with the caloric requirements?

4 The recommended allowances for children are estimated for age groups How is the average value for each age group computed, and what values would you use for a 12-year-old boy large for his age?

5 Choose any dietary pattern with which you are familiar and plan a day's menu to meet the recommended allowances, using foods well liked by the people for whom it is intended

6 Which factors are most difficult to obtain in sufficient quantities in low-cost meals in your locality at the season of year when you are studying this chapter?

7. Choose any person of your acquaintance whose diet is restricted in certain foods and make the necessary substitutions to provide a diet that meets the recommended allowances

8. Select a family that you know with at least 3 growing children Assume that they are on a liberal income and plan the day's menu and make out the market order, taking into account home-produced foods

9 What food fads have you heard discussed or seen practiced? How would you help a layman to distinguish between fact and fad or between true and false ideas about food?

See Bibliography in Part Four for other pertinent material on the topics discussed in this chapter.

of neighbors or friends and to be misguided by ideas with a plausible sound. Why not ask advice of medical and nutrition authorities? Some food fads in themselves may be relatively harmless, but when they lead to delay in seeking necessary medical advice they can be dangerous indeed. In any event, food fads may increase food costs unduly and result in the omission of foods really needed.

The commercial advertising of food products seems to be somewhat less objectionable now than it was a decade ago Perhaps some of the adverse publicity and complaints have had an effect. There are still some candies and other sweets that expound the idea of "health and vitality" through "cheap, quick energy" Obviously, such statements are misleading and tend to exaggerate the nutritive value of candy. These advertisements are frequently addressed to young people who have only a few nickels to spend for their lunch and desire the most for their money.

So-called natural foods are quite apt to be recommended along with raw foods. raw in place of refined sugar, sea salt in place of table salt, olive oil in place of other fat, lemon juice in place of vinegar Except for price, there is no particular objection to these, but neither is there anything poisonous or harmful in the foods for which they are substituted

Certain vegetable juices have been credited with more virtues than they actually possess An increased consumption of vegetables may be advised for some people, but there is no scientific foundation for such claims as. celery juice for indigestion *and rheumatism,* carrot juice for the complexion, parsley

are found in certain foods, medical literature will report it with supporting evidence.

Special food combinations are "prescribed" in certain systems of eating. He who dares to indulge in protein and *starches or perhaps starches and acid* fruits at the same meal faces dire consequences, we are told. There is no physiologic basis for the notion that the normal human digestive apparatus is not equipped to deal with these foods, whether eaten individually or together. Most natural foods are combinations, whether we will or no, even the diet faddists cannot avoid them, but they

tion and adds advice on how to protect ourselves.

Earmarks of quackery and misleading propaganda should be familiar to the layman. *Extravagant claims for cure or* relief of various complaints are always to be doubted. Vague labeling which

because the laws are stricter about labels.

Promoters of most of the fad diet systems or health institutes have per-

personal appearances, but they also work through the mails, the radio, the newspapers, handbills, newsstand publications and books with catchy titles

Your interests are safeguarded by such agencies as the United States Food and Drug Administration, the Federal

[5] Mitchell, H S: J Am Dietet. A 17: 67, 1941.



[illegible] is a party given to celebrate the beginning of a [illegible] that the women and the children stand and wait until the men finish eating (Standard Oil Co., New Jersey)

may drink coffee or, possibly, tea in its place. On the other hand, second-generation families from southern European stock have adopted the use of milk, even for adults, although this was not the custom in their own country.

In their own countries, most of the nationality groups were accustomed to cooking vegetables with meat, but, here again, the price of vegetables seems exorbitant and their use may be reduced far below what is necessary for health. In the majority of instances, the great problem of the nutrition worker and the nurse is to teach these people the value of milk and vegetables in the diet and to assist in planning the budget so as to cover these two necessary items.

Characteristic food habits of every regional or national group should be respected, because there are good nutritional practices in each of them. Emphasis should be placed on the desirable features of the established food pattern and methods of preparation that preserve maximum food values. In fact, nutritional needs may be met by many different patterns of eating. Although the choice of foods and the methods of preparation may differ from those to which we are accustomed, it often happens that the foods used fall into the

Understanding the Significance of Food Habits
Regional Differences in Food Patterns in the United States
Dietary Patterns of National and Cultural Groups
Nutritional Problems of Transplanted Peoples
Favorite National and Regional Dishes

CHAPTER ELEVEN

Regional, National and Cultural Food Patterns

UNDERSTANDING THE SIGNIFICANCE OF FOOD HABITS

A problem that often confronts the public-health nurse or the nutritionist concerns regional or national food habits Our population has come from all parts of the world and has brought a variety of dietary habits and taste quite as fixed as our own. Dietary problems among foreign-born families are bound to arise because of the fact that foods that have been staples in their diet may now be expensive, while foods that have been considered luxuries are comparatively cheap. Sugar and white bread, for instance, are among the least expensive foods in this country, while milk, vege- [illegible]

[illegible]

when the nurse gives advice in regard to food selection If the nurse considers [illegible]

[illegible]

peoples of the rural class live sanely in their own countries, but on arrival in America they find conditions so changed from those of their own land that it is often difficult for them to make the necessary adjustment. Not knowing that one food is more valuable than another, or that certain things are essential while others are merely pleasant adjuncts, they are likely to choose their new diets unwisely.

In the past, many of the immigrants who came to our shores were of the farming class Some had been accustomed to raising their own produce, to having their own goats or cows for the production of milk and the manufacture of cheese, their own chickens, ducks and geese, and their own fruit trees and vineyards It is very difficult for them to realize that milk, for instance, can possibly be worth from 23-30 cents per quart, especially since they believe it to be a drink and not a food Many of these people also are accustomed to goat's milk and find it difficult to make the change to cow's milk. Therefore, milk often is one of the first foods on which the family economizes. The children

recommended to meet nutritional requirements

In the South, hot breads are served at nearly every meal, and baker's yeast breads are not popular. There is a preference for vegetables that have been *cooked a long time and often with fat* pork Undoubtedly some vitamins are destroyed by this process, but the common use of pot liquor conserves the nutrients which are in solution. The wide variety of greens used compensates in a measure for the low consumption of milk and cheese as sources of calcium and vitamins. The scarcity of fresh milk in some localities has encouraged the use of evaporated and dry milk.

In the Southwest, the Mexican in- [illegible]

original pattern of eating, it is being introduced gradually In the Mexican home preparation of corn for *tortillas,* the lime used introduces calcium, an essential mineral which otherwise would have been deficient.

In the Far West, the infiltration of Oriental cultures has influenced food habits [illegible]

In the north central [illegible]

by regional choice of ingredients Many of these states produce and use large quantities of dairy products, especially cheeses of several varieties closely re- [illegible]

Locally grown fruits and vegetables are used in season and preserved for winter use. This is a good custom and should be encouraged

On the east coast and in New England, many traditional dishes have come *down from the Pilgrim settlers. The use* of corn meal in Indian pudding and johnnycake was acquired from the Indians by their new neighbors Baked beans, cod-fish cakes, clam or fish chowder and turkey for festive occasions are all old New England traditions, some of which have been adopted nationally A [illegible]

such as squash, turnips and carrots, are popular.

In isolated communities in any part of the country, unusual food habits may be encountered Malnutrition may result from a limited variety of foods grown locally, especially if soil and drinking water happen to lack essential nutrients and the economic status does not allow of the extensive use of foods from other producing areas. Sporadic outbreaks of actual deficiency diseases have been reported occasionally Such instances are less common today, since state health departments are recognizing their responsibilities for these conditions quite as much as they are for the control of communicable disease.

In metropolitan areas a great variety of food patterns may be found. In large cities, there may be whole sections in which the inhabitants follow as closely as possible the food customs of the country from which they have emigrated This influence is retained to some extent by a second generation. People who come to the city from regions of the United States where definite types of foods are preferred continue to attempt to follow the diet to which they have been accustomed. Usually they can be persuaded to supplement their meals with the foods that are more generally available in the city than they were in

Four Food Groups and provide nutrients that meet recommended allowances.

The four nationality patterns chosen at random to illustrate this point in the Overseas Supplement[1] to this text each provide adequate amounts of essential nutrients.

If the nurse or the social worker knows the family food customs, this will play an important part in establishing good relations. A family may be encouraged to continue its own methods of preparation and seasoning when these are not incompatible with health and then gradually institute necessary changes to correct poor practices.

Unfamiliar foods and methods of preparation need to be studied and possible values recognized before changes are suggested For example, the Mexican [illegible]

Success in making necessary changes in lifetime habits demands sympathy and understanding. Special diets should be interpreted for the patient or the homemaker in terms of the regional or the national food pattern. A woman of foreign birth or one from a different part of the country may have little contact [illegible]

where the mother has had the opportunity to learn to adjust to local foods and customs shows that instruction, as well as understanding, is an important phase of nutrition work

While it was once held that the stature of certain races was due to climate, now it is generally believed that these racial differences are partially the result of differences in food Holt states that statistics show that Japanese children in the United States, both boys and girls, are taller and heavier than those of corresponding ages living in Japan; also that children of the successful and prosperous Russian Jews—those who have become to a considerable degree Ameri- [illegible]

are seen among the very poor, where the mode of life and food has altered little from that of the parents. While happiness, usefulness and even success in life are by no means dependent upon the height and the weight of the individual, a fine physical development is always desirable. A frail body or habitual poor health is a serious handicap in life

In this chapter special attention is given to regional and national food patterns which are distinctive A knowledge of these food preferences and attention to them may help to build the bridge of understanding between the health worker, the nurse or the nutritionist and the family that she is trying to assist

REGIONAL DIFFERENCES IN FOOD PATTERNS IN THE UNITED STATES

Anyone who has traveled in different parts of the United States and has eaten meals typical of various regions is aware of differences in menus, food preparation and local terms for foods or special dishes. Part of the joy of travel is in eating the traditional foods of each locality. On the other hand, natives of certain regions who relocate for various reasons may have strong preferences for familiar dishes. Boys in the Army indicated such preferences, and these were considered when possible.

People who are ill are much more likely to want familiar foods cooked in a traditional manner Therefore, it is pertinent for the dietitian and the nurse to recognize some of these regional differences which exist in our own country In some instances, modification of a familiar pattern of eating may be

[1] Cooper, Barber, Mitchell and Rynbergen· Overseas Supplement to Nutrition in Health and Disease, Philadelphia, Lippincott, 1956

recommended to meet nutritional requirements.

In the South, hot breads are served at nearly every meal, and baker's yeast breads are not popular. There is a preference for vegetables that have been cooked a long time and often with fat pork. Undoubtedly some vitamins are destroyed by this process, but the common use of pot liquor conserves the nutrients which are in solution. The wide variety of greens used compensates in a measure for the low consumption of milk and cheese as sources of calcium and vitamins. The scarcity of fresh milk in some localities has encouraged the use of evaporated and dry milk.

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In the Far West, the infiltration of Oriental cultures has influenced food habits. [illegible]

features to be commended.

In the north central states, there is a mixed racial background with a strong northern European and Scandinavian heritage in many localities. Even third-

[illegible]

quantities of dairy products, especially cheeses of several varieties closely re- [illegible]

Locally grown fruits and vegetables are used in season and preserved for winter use. This is a good custom and should be encouraged.

On the east coast and in New England, many traditional dishes have come down from the Pilgrim settlers. The use of corn meal in Indian pudding and johnnycake was acquired from the Indians by their new neighbors. Baked beans, cod-fish cakes, clam or fish chowder and turkey for festive occasions are all old New England traditions, some of which have been adopted nationally. A

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such as squash, turnips and carrots, are popular.

In isolated communities in any part of the country, unusual food habits may be encountered. Malnutrition may result from a limited variety of foods grown locally, especially if soil and drinking water happen to lack essential nutrients and the economic status does not allow of the extensive use of foods from other producing areas. Sporadic outbreaks of actual deficiency diseases have been reported occasionally. Such instances are less common today, since state health departments are recognizing their responsibilities for these conditions quite as much as they are for the control of communicable disease.

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the part of the country where their food habits were established.

DIETARY PATTERNS OF NATIONAL AND CULTURAL GROUPS

Jewish Dietary Habits

Probably one of the most difficult dietary problems for the health worker is that of the Jews, because of the many religious restrictions that are applied to the diet No health worker can afford to ignore the religious ideas or customs of a people, for confidence is the basis upon which all successful social work rests

The following description of the dietary laws of the Jews is quoted from *Foods of the Foreign Born*,[2] and from *Jewish Dietary Problems* [3]

1. *Prohibited Foods*

Prohibition of Animal Foods Absolute and *partial prohibitions*

Unclean animals are absolutely prohibited. Clean animals all are quadrupeds that chew a cud and also divide the hoof All others are regarded as not clean

Products of animals that are suffering from some malady or that have died a natural death or had eaten poison are *regarded as "terefah," unclean, and may* not be used

All animal foods which are not ob-

other—may be eaten. This would bar all shellfish, such as oysters or lobsters, as well as fish of the eel variety.

No scavengers or birds of prey are to be eaten. These are regarded as unclean

2 Wood, Bertha M · Foods of the Foreign Born, New York, Barrows, 1929

3 Schapiro, Mary L Jewish Dietary Problems, J Home Econ, Feb, 1919

is forbidden

2. *Prescribed Modes of Preparing Food*

The following partial prohibitions are fully as important as the above

forated or fluted, and placed in an oblique position, so as to enable the blood to drain off. It is allowed to remain thus for one hour, after which time it is to be washed three times. The washing is for the purpose of removing all the salt This process is called kosher and is regarded as very important.

Bones with no meat and fat adhering to them must be soaked separately, and during the salting should be placed near the meat

Chops and steaks may be broiled.

The heart may be used, but must be cut open lengthwise, and the tip removed before soaking. This enables the blood to flow out more freely. Lungs are treated as is the heart Milt must have veins removed The head and feet may be koshered, with the hair or skin adhering to them. The head must have the brain removed This latter is used, but *must be koshered separately*

To kosher fat for clarifying remove the skin and proceed as with meat In

turned back or cut, so that the vein lying between two tendons may be removed

Seething a kid in its mother's milk is forbidden This is the origin of the prohibition against the cooking of the meat

and milk together, or of the eating of such mixtures. This rule is rigidly adhered to, and in its present application necessitates the use of a complete double equipment of dishes and utensils. Since this rule is regarded as one of the most important, one can understand why such sauces as butter sauces or white sauce are refused at meals with meat. This rule occasions the home economics teacher considerable trouble in planning menus.

Meat and fish should not be cooked or eaten together, for such a mixture is supposed to cause leprosy. The mouth has to be washed after eating fish and before meat may be eaten.

3. *Jewish Holidays*

Sabbath. No food may be cooked on the Sabbath. This means that all cooking for both days is done on Friday. This need has led to the development of foods such as Sabbath Kugel or Sholend, Petshar, and many others.

Passover. During Passover week no leavened bread or its product, or anything which may have touched leavened bread, may be used. This restriction holds for eight days. In every Jewish home a complete and most thorough system of cleaning precedes this holiday. No corner escapes a scrubbing and scouring, lest a particle of leaven, or what is just as bad, a particle of food which may have touched leavened bread, should be found. A complete new set of dishes is used during the week. Cutlery, silver, or metal pots may be used during this holiday if properly koshered or sterilized. The usual method of doing this is to plunge red-hot coals into boiling water, and then to immerse the desired utensils. These or any other Passover utensils may be used after the holiday is over without rekoshering, but once used without Passover precautions they are unfit for Passover use unless rekoshered. In actual practice this means that in every orthodox Jewish household there are four sets of dishes—the usual set for meat and the set for milk food, in addition to duplicate Passover sets. The Passover dishes are stored away very carefully, lest some leaven come near them.

Because of the need for abstaining from leavened bread during Passover, many interesting dishes have developed, such as the Mazzah Klos (dumplings), soup, cakes and puddings made of the mazzah meal. Almond pudding and cake are very popular. Almost all of the food cooked during this holiday requires the liberal use of shortening or fat, with great danger of a too liberal use for health, as well as from the economic point of view. The fat generally used is either goose or chicken drippings, or clarified beef fat other than suet.

Fast Days: (A) Yom Kippur (the Day of Atonement). No food or drink may be had for 24 hours. (B) Fast of Esther. This precedes the Feast of Purim and is now observed only by the very pious. The Feast of Purim is universally observed.

Semifast Days. Eight days in Ab. For nine days no meat food may be eaten by the orthodox.

A striking characteristic of the Jewish diet is the richness of the food, including pastries and cakes, foods rich in fats, and preserves and conserves, as well as stewed and canned fruits. Pickles and "sours" are also used abundantly. No pork or pork products are used. Meat and milk must not be served in the same meal. Butter, being a product of milk, must not be served with meat. Most vegetables, therefore, are cooked with the meat. Cooked vegetables are more often served in soup than otherwise. Borscht, a soup made with "sour salt" (tartaric acid) and vegetables to which sour cream is added, is a favorite dish but is not served with the meat meal. This limits the amount of vegetables used, although the salad vegetables—lettuce, cucumbers, tomatoes and scallions—are served quite frequently, either plain or with sour cream. Cereals, especially barley and buckwheat (kasha), are served as a vegetable with meat or in soup, either in a meat stock or cooked in milk.

Noodles and other egg-and-flour mixtures are used quite extensively.

the part of the country where their food habits were established.

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To kosher fat for clarifying remove the skin and proceed as with meat. In

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Seething a kid in its mother's milk is forbidden This is the origin of the prohibition against the cooking of the meat

favorite dish, and bread and butter are served with this dish

The Italian immigrant finds coffee in America cheaper than in his own country, and it is not uncommon to find the children partaking of this beverage in place of milk The Italian buys food in small quantities, such as the breast of a chicken or merely one wing, using such pieces to flavor a whole dish When refrigeration is limited, perishable food never is provided in great abundance

The Italians have many kinds of cheese, which are used freely. However, some have a strong aversion to American cheese, and an investigation conducted in New York disclosed the fact that when Roman cheese cost $1 25 a pound, it was considered such an essential that in the poorest Italian homes, where the investigator found the family suffering from the cold and the lack of food, it was still being purchased in small quantities. However, a taste for sweets is acquired rapidly in this country, the children eating a great deal of candy between meals. This, together with too much coffee and too little milk, is the most difficult phase of the nutritional problem among Italian children The trend in recent years has been toward more milk both for children and for adults as incomes became more adequate and education in the value of milk more widespread

While the use of green vegetables and fruits in the Italian diet is to be commended, there should be encouragement in the use of milk, coarse cereals, root vegetables and potatoes Candy between meals and coffee for the children should be discouraged

Hungarian Dietary Habits

In the native Hungarian diet, between 50 and 60 per cent of the calories are from grains and potatoes Pork, either fresh or cured, is the favorite meat, especially in rural areas As a rule, Hungarian foods are more highly seasoned than the average European dishes. Paprika is used freely as a seasoning, likewise onions and fresh peppers, both green and red Sour cream is used both as a sauce and in certain cooked foods. Sauerkraut is popular Fish and shrimp [illegible]

aged, as should the use of more milk.

Polish and Slavic Dietary Habits

Potatoes and bread are major items in the Polish food pattern, grains and potato together providing from 60 to 70 per cent of the total calories Rye and buckwheat flour are used freely. Coarse cereals may be cooked in milk but rarely are served with milk Potatoes are eaten at almost every meal Pork and pork products, especially sausage, highly seasoned, are popular, but meat of any kind is a luxury in rural areas Fresh, salted and pickled fish are favorite foods Cabbage may be used raw, as kraut or cooked and most vegetables are cooked with meat. Sour cream and cottage cheese are used extensively

The use of more milk (particularly for the children), of more raw vegetables and of more fruits should be encouraged These people may profitably increase the use of canned tomatoes in winter, a custom only recently accepted in Europe

For a more detailed summary of European food patterns the student may refer to an earlier publication by Mitchell and Joffe[5]

Armenian, Turkish and Greek Dietary Habits

The inhabitants of the Near East are an outdoor people Most of them are farmers. they raise their own sheep, goats, cattle, chickens, ducks and geese,

[5] Mitchell, H. S , and Joffe, N F.: Food patterns of some European countries, J. Am. Dietet. A. 20 676, 1944.

Rye and whole-wheat breads are well liked, as well as crusty rolls.

Dried fruits, as well as fresh, are used by those who can afford them.

Fish is served quite frequently, especially cod, haddock, carp, salmon and white fish, as well as the smoked and the salted fishes—herring, salmon and sturgeon. Gefullte fish is a delicacy prepared in almost all Jewish homes. Chicken is considered almost an essential for the Sabbath evening meal.

In prescribing diets for the Jewish people, it might be helpful, both to the person who prescribes and the patient for whom the diet is prescribed, to remember that all their foods may be classified under three heads: (1) Meat or fish, (2) milk and its products, and (3) neutrals. Meat and milk are never mixed. Neutrals may be used with meat or with milk products, but never with both in the same meal

Because milk in any form cannot be served with meat at the same meal, the diet of Jewish children often lacks the proper amount of milk. The use of more milk for the children, more green vegetables and canned vegetables and fresh and canned fruits for the whole family should be stressed The continued use of rye bread, legumes, coarse cereals, dried fruits and a variety of fish which are characteristic of the Jewish diet is advantageous.

Italian Dietary Habits

The Italian immigrants who come from northern and central Italy are

children. Cheese is also made from it and used freely. Eggs are in common

dishes. Dark bread made from the whole wheat is a standby. Approximately 40 per cent of the native Italian diet is from wheat in some form and from 60 to 70 per cent from grain and potatoes combined, the root vegetables being used more in the north than in the south of Italy.[4] Olive oil or lard is used in various

factory for use at any meal of the day.

The Tuscan and the Umbrian peasantry live almost exclusively on the "minestra," which word is usually translated "soup," made of vegetables with meat stock. On gala occasions, either noodles or rice is added, and grated cheese always is sprinkled on it.

A typical Italian breakfast consists of black coffee for adults, milk for children, and bread without butter. The noonday meal consists of bread, cheese and black coffee, with perhaps one of the many

ing in the fields or away from home at midday. The menu at this meal is a little more varied, although it usually consists of one dish. Meat or beans often serve as a basis. The cooking of this dish is started in the morning. Later on, vegetables are added and still later macaroni and the fat, which may be lard or olive oil. Polenta, a thick corn-meal mush, to which tomatoes, cheese or a bit of pork and garlic has been added, is another

[4] Bennett, M. K.: Food for Postwar Europe, Food Research Institute, Stanford Univ Press, War-Peace Pamphlet No 5, 1944.

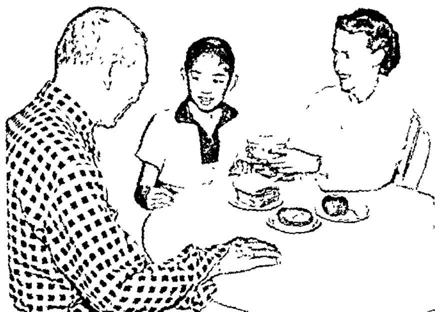


Fig 34 Boy acting as interpreter for Chinese diabetic patient who is being instructed regarding the carbohydrate equivalent of his favorite bowl of rice. (Frances Stern Food Clinic of the Boston Dispensary)

are much relished by them, as well as other types of "preserved" eggs, which are eaten much as we in this country eat sweets.

Japanese Dietary Habits

The Japanese diet is similar to the Chinese but differs slightly in methods of cooking and seasoning In general, the Japanese use more fish and a smaller variety of vegetables and grains than the Chinese. Even before World War II, the dairy industry in Japan had developed so that it was possible and safe to buy fresh milk. Eggs are used fresh but not fermented, as in China.

Mexican Dietary Habits

The Mexicans use freely many varieties of beans, as well as rice, potatoes, peas and some vegetables. Chili, a variety of pepper, is also popular The chili plant is sacred to the Mexican, who is supposed to be blessed in health if he uses it plentifully The tomato always is prominent in Mexican cookery. Mexicans use little meat and practically always cook it with vegetables. They have a strong aversion to meat that is not perfectly fresh and slaughtered in the approved Mexican style Chili con carne is a favorite meat dish It consists of beef seasoned with garlic and chili peppers and cooked several hours. Tamales also are popular They are made of corn meal and ground pork, highly seasoned, they are rolled in corn husks and steamed. Tortillas, made with ground whole corn which has been soaked in lime water and baked on a griddle, serve as a



Fig 33. Familiar foods give children of other nationalities a feeling of security. (FAO, from UN film Battle for Bread)

they produce their own grains and grow fruits and vegetables in abundance. Grains, rice or wheat furnishes the major source of calories The whole wheat is parboiled and cracked for use as a staple starchy food at the main meal Eggs, butter and cheese also are produced on the farm. Lamb is the favorite meat The food is not highly spiced but is rich in fat. The fat is cooked with the food and this serves in place of butter. Matzoon, or yoghurt, a sour-milk preparation, is used almost universally by these people, sweet milk is seldom used. Black coffee, in which the pulverized bean is retained, is the preferred beverage

Chinese Dietary Habits

The Chinese diet is varied, consisting of eggs, meat, fish, cereals and a large

sp[illegible] ... [illegible]ked and

grown abundantly, and some 30 or more products are manufactured from it. The protein is high and of good quality.

Rice is used freely and takes the place of American bread, particularly in southern China In northern China, wheat, corn and millet seed are used in abundance The millet seed (ground or whole) is made into cakes or a thin mush, the latter being the form in which it is given to children. Noodles are widely used Grains and, in some areas, sweet potatoes constitute the chief source of calories in the Chinese diet, grain and potato together provide from 70 to 90 per cent of the total calories

The quantity of meat eaten is small, and usually it is served with vegetables. These are cut into small uniform pieces in conformity with an ancient law laid down by Confucius, the philosopher, specifying that food should not be eaten unless it had first been chopped or cut into small pieces Pork is the chief meat of the poorer classes. Lamb and goat meat are used when available, but beef is uncommon

In certain parts of China, a child rarely tastes cow's milk, but water buffalo milk is used to some extent. Soybean milk and cheese are more common. When transplanted to this country, the Chinese readily accepts the use of dairy products for children and adults

The Chinese use practically every part of the animal as food (with the exception of the hair and the bones); even the brain, the spinal cord and the various internal organs, as well as the skin and the blood, are utilized. Coagulated blood is sold on the market in pieces similar to liver and, since this is one of the inexpensive foods, it is used freely Fish and shellfish are also in common use. They are sold alive, for the Chinese have a strong aversion to dead fish and consider them unfit for food.

Eggs, including hen, duck and pigeon eggs, are used in abundance, when they can be afforded. The Chinese prepare what is known as fermented eggs, which

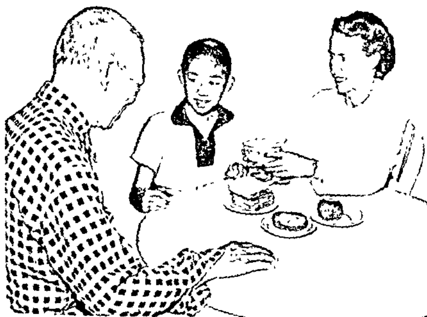


Fig 34. Boy acting as interpreter for Chinese diabetic patient who is being instructed regarding the carbohydrate equivalent of his favorite bowl of rice. (Frances Stern Food Clinic of the Boston Dispensary)

are much relished by them, as well as other types of "preserved" eggs, which are eaten much as we in this country eat sweets.

Japanese Dietary Habits

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[illegible]

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and baked on a griddle, serve as a

bread. The lime provided in this fashion

should be encouraged, and, if a change to the American type of bread is made, it should be of the whole-grain or enriched type.

Portuguese Dietary Habits

The dietary habits of the Portuguese are similar to those of the Mexicans. Their consumption of wheat products is lower than that of any other southern European country, but use of grains other than wheat is liberal. They use many spices and peppers, allspice and mace are favorites

Puerto Rican Dietary Habits

Puerto Rican dietary habits are not unlike those of other Latin-American countries Rice and beans are the staple foods, used almost daily and often cooked together. Salt codfish is used more often than fresh fish Pork and beef are the favorite meats. Plantain and some root vegetables, along with fresh tomatoes, peppers and onions, are used commonly Bananas, oranges and pineapple are popular and relatively inexpensive in Puerto Rico, and much to be preferred to canned fruits, which have been widely introduced Even more important are some of the native fruits which are not familiar in the north such as the mango and the West Indian cherry which has only recently been fully appreciated as the richest known natural source of ascorbic acid.

Puerto Ricans living in the north may have to adjust to different fruits in season and to canned fruits They may well be encouraged to use more milk and *cheese, cheaper cuts of meat to* supplement the protein at meals when rice and beans are served Acceptance of canned tomatoes in place of more expensive fresh ones out of season, margarine in place of butter or expensive oils, and cheaper cuts of meat would provide better nutrition for the same cost. Malnutrition and tuberculosis are common among Puerto Rican children living in the United States, an indication of the need *for improved nutrition*

NUTRITIONAL PROBLEMS OF TRANSPLANTED PEOPLES

The transplanting of peoples from tropical or semitropical climates to northern parts of the United States presents special nutritional problems Vegetables and fruits which were cheap in a southern area may be expensive, and it is difficult for people to choose acceptable foods from among those which they can afford. Southern markets may provide *a variety of greens which are used* abundantly, but cost and lack of variety in northern markets may discourage their use These same greens may have provided minerals and vitamins essential for health. The limited consumption of milk may not have been as serious for the children eating more of such greens as it is when they move north and fail to make the necessary compensation

In the case of dark-skinned races, Negroes, Mexicans and others, the children seem to be especially susceptible to rickets in the north, possibly due to lessened exposure to sunlight. Thus more attention to milk and adequate sources of vitamin D is paramount These same people show increased susceptibility to tuberculosis in the north, and, again, protective foods are important Thus a marked change in climate may involve adjustments in food to meet modified requirements.

FAVORITE NATIONAL AND REGIONAL DISHES

A study of some of the main dishes of different nationality groups indicates that people the world over eat much the same kinds of foods They may combine or season them differently or serve them at a different time of day, but they pro-

vide the same nutrients. Actually, it is fun to prepare and eat dishes which are the favorites of other nationalities or races. The United Nations Cook Book[6] [illegible] the UN Recipes for several popular main dishes from different countries are given in Chapter 49. Numerous regional and foreign cookbooks are available for those who enjoy trying their culinary skills on unfamiliar dishes.

As a source of information on vitamins and minerals in unusual foods FAO has published Food Tables for International Use.[7]

STUDY QUESTIONS

1. Why is it essential that a public-health nurse or a nutritionist be able to adjust her advice on nutrition concerning various regional and national food patterns?

2. What evidence is there that stature may be influenced by nutrition as well as by racial inheritance?

3. After noting the regional dietary habits in the United States, which ones in the South and the Southwest would you recommend and encourage, and what changes would you recommend?

4. How has the infiltration of various cultures influenced the food habits of those in various regions of the United States?

5. Why is the Jewish diet one of the most difficult problems for the health worker? What are some of the dietary laws which must be respected?

6. How does the use of grains, potatoes and meat vary among the following racial groups: Italians, Hungarians, Poles, Greeks and Turks?

7. How can you help others to gain respect for the food habits and the favorite dishes of nationality and regional groups other than their own? Where would you look for recipes and food values?

[6] Favorite Recipes from the United Nations—1956, U S Committee for U N, 816 21st St, N W., Washington, D C

[7] Food Composition Tables—Minerals and Vitamins for International Use, FAO, Rome, Italy, 1954

See Bibliography in Part Four for other pertinent material on the topics discussed in this chapter.

Nutritional Demands of Pregnancy
Food Selection in Pregnancy
Complications of Pregnancy Involving Diet
Diet During Labor
Diet Following Delivery
Diet in Lactation

CHAPTER TWELVE

Nutrition in Pregnancy and Lactation

NUTRITIONAL DEMANDS OF PREGNANCY

Pregnancy makes many demands on the prospective mother, not the least of which are her nutritional needs and those of the unborn infant Formerly it was assumed that, except in cases of acute deficiencies in the diet, the fetus would not be affected In recent years, studies of nutrition of women during pregnancy have shown that there is a definite relationship between the diet of the mother and the condition of the baby at birth. These studies have also

mother and the baby.

Not only are the mother's nutritional needs increased during pregnancy, but, if she has always eaten a diet that was adequate in all essentials, she has a

has had a poor food intake

Nutrition Studies in Pregnancy. One of the most conspicuous findings of *recent studies is that the diet of a very* large percentage of pregnant women does not meet the nutritional allowances recommended by the National Research Council (*see* p 116) That these deficiencies are in a large measure related to income levels is also apparent. Jeans,[1] reporting on a study in a rural state, found a direct correlation between the amounts of all nutrients present in the diet and the income levels of his patients Trulson and co-workers,[2] in a study of 1,567 pregnant women of low-income status from both city and rural areas, found that only 20 per cent met the recommended figures for protein intake, only 20 per cent had sufficient milk, and only 25 per cent had sufficient vitamin C in the diet However, many women with incomes sufficient for their needs also may be found to be eating an inadequate diet in one or more respects.

The effect of such poor food intakes

[1] Jeans, P. C., *et al* J. Am Dietet A 28 27, 1952

[2] Trulson, M., *et al* · J Am Dietet. A 25 669, 1949

on the condition of the newborn baby is best illustrated by the studies of Burke and her co-workers[3] at the Harvard School of Public Health and the Boston Lying-In Hospital Figure 36 shows the relationship of the mother's diet to the health of the baby. In a study of 284 women, it was found that those on good or excellent diets (42 mothers) had babies in good or excellent condition at birth, with only 2 exceptions. The mothers on fair diets (202 patients) had babies rated largely as good or fair Those mothers on poor to very poor diets (40 patients) had babies rated as fair or poorest, with only 3 exceptions. The poorest infants were those who were stillborn or born prematurely, who died within 3 days of birth, who had congenital defects or who were functionally immature.

The question sometimes is asked, what is meant by a "poor" diet? Such a diet is usually low in all the necessary food nutrients, there may even be one food group, such as milk, entirely missing from it. An example of a poor diet is a day's food intake of a mother who

at which time more pastry and coffee are consumed Often she is not hungry at lunch, nor does she enjoy preparing

needs, except perhaps for calories Another patient drank up to 15 cups of tea daily, each with 2 teaspoonfuls of sugar, and found that she was not always hungry for other food.

[3] Burke, B S, et al J Nutrition 38 453, 1949.

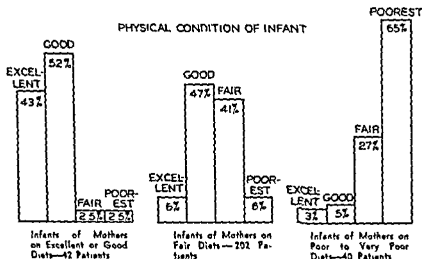


Fig 35. Condition of infants at birth in relation to the prenatal diet of the mother Note the decrease in excellent and good ratings for infants and the increase in fair and poorest infants as the diet goes from good to poor (Adapted from Burke, B. S., et al., J. Nutrition 38:453, 1949)

latter part of pregnancy tended to be short, light in weight and likely to receive a low pediatric rating in other respects. They suggest that it is not possible to indict protein alone, as a low intake of the B complex vitamins, found in many protein foods, may also play a part in these findings. Dieckman *et al.*[5] also have shown that there is an increased incidence of abortion with a low protein intake on the part of the mother The same investigators found that the pediatric rating of excellent infants increased steadily in number with an increased protein intake by the mother

Extra protein in the diet will be supplied by additional milk up to 1 quart a day, but if the Recommended Dietary Allowances of a 20 Gm protein increase are to be met, the meat and egg intake will have to be increased as well This may be done by urging the mother to have a serving of meat, fish or poultry at her main meal and to have a "protein" sandwich at lunch or supper Sandwich fillings contributing valuable amounts of protein are cold cuts, tuna fish, salmon or sardines, cheese and eggs Peanut butter is a good source of protein and of the B vitamins, and may be used liberally if the mother is not overweight

Extra protein may be supplied inexpensively by the generous use of dried skim milk in creamed soups and other dishes in which milk is an ingredient. Jeans,[6] in discussing the study already referred to, says "The need for greater intake of milk and milk products is of major importance in pregnancy The addition of even a pint of milk daily would better the intake of protein and riboflavin in the poorest diet to a real degree, and would more than double the present intake of calcium of nearly half the women. . The use of low cost dry milk solids would benefit greatly those unable to buy sufficient fresh milk."

[5] Dieckman, W J, *et al*: J. Am. Dietet A 27 1046, 1951.

[6] *Op. cit.*

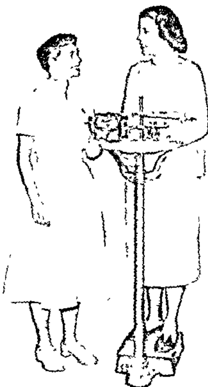


Fig 36 The nurse has an excellent opportunity for teaching while doing routine procedures Here nurse and mother discuss weight gain and nutritional needs. (Paul Parker)

Calcium and Phosphorus Requirements The pregnant woman must be supplied with calcium and phosphorus in quantities large enough for her own needs and those of the bony framework of the body of the growing fetus and for the formation of its teeth. A quart of milk a day will supply a large proportion of the needed calcium and phosphorus, as well as a good proportion of the necessary protein

The proper utilization of calcium and phosphorus depends upon the inclusion of a certain amount of vitamin D in the diet. Many cities today offer milk to

It will be seen from the foregoing that the importance of nutrition in pregnancy is poorly recognized by a large section of the population, and that nurses, as well as many others in the medical field, must assume more responsibility for teaching this group better nutrition

Nutritional Requirements. The table on page 142 shows the Recommended Dietary Allowances of the National Research Council for pregnancy and lactation compared with those for the young nonpregnant woman. These will vary with the weight, the age and the activity of the mother, and should be used only as a guide

CALORIES While metabolism rises during pregnancy, this occurs largely in the second half The recommended increase in milk intake from 1 pint to 1 quart will increase the caloric intake by approximately 300 calories However, the increase in milk intake should begin as soon as pregnancy has been established, not for its caloric but for its valuable protein, calcium and vitamin content There should be no increased intake of purely energy foods such as fat and carbohydrate if the weight is within normal limits. (*See* Table 10, Part Four)

In cases of too rapid weight gain or of overweight, it may be necessary to decrease the mother's caloric intake. However, it must be remembered that enough calories should be included to allow the protein in the diet to be used for the building of new tissue rather than to be broken down for energy.

In cases of underweight, often the sign of undernourishment, the amounts of all nutrients should be increased in the interest of preserving the health of both mother and baby.

PROTEIN REQUIREMENT The protein intake must be increased in pregnancy because of its specific contributions to growth and because, as a rule, a diet low in protein is lacking in other nutrients. As has already been shown, the protein in the diet of many pregnant women falls below the amounts recommended Besides possible impairment of the health of the mother, unquestionably there is an effect on the condition of the newborn baby when the diet is low in protein. Burke[4] and her co-workers found that infants of mothers eating less than 75 Gm of protein daily during the

[4] Burke, B S J. Am Dietet A 20 735, 1944

RECOMMENDED DAILY DIETARY ALLOWANCES FOR A MODERATELY ACTIVE WOMAN DURING PREGNANCY AND LACTATION

(Food and Nutrition Board, National Research Council, Revised 1958)

NUTRITIONAL ESSENTIALS	NONPREGNANT WOMAN 58 KG —25 YRS OLD	PREGNANCY SECOND HALF	LACTATION (850 CC. DAILY)
Calories*	2,300	2,600	3,300
Protein, Gm	58	78	98
Calcium, Gm	0 8	1 5	2 0
Iron, mg	12	15	15
Vitamin A, I U	5,000	6,000	8,000
Thiamine, mg	1 2	1 3	1 7
Riboflavin, mg	1 5	2 0	2 5
Niacin Equiv ,† mg	17	20	19
Ascorbic acid, mg.	70	100	150
Vitamin D, I.U		400	400

* ... ormed vitamin and the pre-

Warkany[9] and his co-workers, by creating a severe deficiency of vitamin A in the diet of experimental animals, obtained young without eyeballs and with other severe eye defects Warkany,[10] by depleting mother rats of their stores of riboflavin, was able to produce severe skeletal anomalies, such as fused ribs, fingers and toes, and cleft palate Such conditions are not likely to occur in [illegible]

takes place.

Foods rich in vitamins are those which have been discussed as essential for other nutrients. milk and milk products, eggs, meat, fish and poultry, and especially liver, whole-grain and enriched breads, green and yellow vegetables, citrus fruits, tomatoes, cabbage and potatoes. All these must be supplied liberally in the diet of the pregnant woman if she is to meet her own nutritional needs as [illegible]

during pregnancy (Chap. 7).

FOOD SELECTION IN PREGNANCY

In the table on page 144 are listed the foods and the quantities of each that must be consumed daily by the pregnant mother in order to meet the Recommended Dietary Allowances of the National Research Council Such a food intake represents the so-called excellent diet found by investigators to be most likely to produce an infant with a

[9] Warkany, J Harvey Lectures, Series 48, 1952-1953

[10] Warkany, J · Am J Roentgenol/ 47 889, 1942

A Day's Meal Plan for the Healthy Pregnant Woman of Average Weight

Breakfast

Fruit Grapefruit, orange or other fruit or juice rich in vitamin C.

Cereal Whole grain or enriched, served with milk and a moderate amount of sugar, or an egg

Bread One slice, whole grain or enriched, with butter or fortified margarine

Milk: One glass Two cups of cocoa made with milk may be substituted if the mother is not gaining weight too rapidly.

Coffee· As desired Cream and sugar limited if there is too rapid a gain in weight.

Dinner

Meat· A liberal serving of lean meat, [illegible]

Bread One slice, whole grain or enriched, with butter or fortified margarine

Dessert· Desserts made with milk, eggs or fruit should be served often

Milk· A glass of milk.

Supper or Luncheon

Main dish A dish made with eggs if these have not been used elsewhere in the menu, or a cheese dish, or legumes, or a meat or fish sandwich.

Vegetable A cooked vegetable or a salad

Dessert· Raw or cooked fruit with plain cake or cookies

Milk. A glass of milk.

Before Retiring

Milk One glass if there has not been sufficient milk in the menu during the day, or fruit

which 400 I.U. of vitamin D per quart

Iron Requirement. An adequate iron supply during pregnancy is no less important than that of calcium. There is prenatal storage of iron in the fetus for use during the first months of infancy. Clinical studies show that hemoglobin levels tend to be lower in women of the low-income groups. Lund,[7] in a study of a large group of pregnant women in New Orleans, found that 50 per cent of the women had a hemoglobin level below 11 Gm./100 cc. blood, and 20 per cent had levels below 10 Gm All these women were in the low-income groups. This finding may reflect inadequate protein and vitamin intake as well as a diet low in iron, since foods rich in one are often rich in the others also. Therefore, a low hemoglobin level in pregnancy may indicate a generally inadequate diet and endanger the health of both the mother and the infant.

Foods especially high in iron are beef and pork liver, one of which should be included at least once a week. Other good sources of iron are heart, kidney, tongue, all lean meats, chicken, eggs, most green, leafy vegetables, potatoes, whole-grain or enriched bread, dried fruits and dried peas and beans Molasses is an important source of iron in those regions where it is commonly included in the diet. It is not always easy to include sufficient iron in the daily diet, especially in the low-income group.

Iodine Requirement Iodine is also an important element in the diet of the pregnant woman A deficiency of this element during pregnancy may cause goiter in the child or in the mother. The use of iodized salt is suggested for those who live in areas in which the soil and the drinking water are known to be deficient in iodine

Vitamin Requirements. All vitamins are essential for the metabolism of living tissue, and doubly so in growth. In research studies done on animals, it was possible to produce specific congenital defects by depleting the mother animal of a single vitamin. Hale[8] and later

[7] Lund, C J Am J Obst & Gynec 62 947, 1951.

[8] Hale, F.· Am. J Ophth. 18.1087, 1935.

Diet in Pregnancy

Whole milk: 1 qt One oz. of Cheddar cheese is equivalent to 8 ozs milk

Lean meat: One liberal serving (4 ozs) of meat, fish or fowl, liver is desirable at least once each week.

Egg: At least one

Fruit: Two or more servings (1-1½ cups,

day.

Vegetables: Two or more servings of cooked or raw vegetables (1-1½ cups, 200-300 Gm); these should include dark green leafy or deep yellow vegetables, also legumes, several times each week, in addition, a medium potato (150 Gm.) should be eaten daily

Bread and cereal: Whole-grain or enriched bread, at least 4 slices daily (½ cup of cereal is equivalent to 1 slice of bread).

Butter or fortified oleomargarine: 2 tablespoons.

Additional foods. Consisting of either more of the foods already listed or other foods of one's own choice adjusted to individual energy needs and in relation to desired weight gain

Vitamin D: Some form of vitamin D to supply 400 I.U.

other food sometimes heartily disliked, may be eaten as liverwurst or as a liver spread in a sandwich, or it may be disguised in a variety of ways in cooked dishes. (*See* Recipes, Part Three.)

In general, meat and eggs are expensive foods. Dried beans and peas, used by many groups in the United States as well as in many other countries, serve as a partial substitute at much lower cost However, they must not replace the use of animal protein to too great a degree, for the legumes do not supply as good a quality of protein. Fish and eggs are excellent meat substitutes in areas and at times of year when they are cheap. Meats such as heart and tongue are less expensive than other cuts and add variety to the diet

Fruits and vegetables, bought fresh in season, are usually least expensive However, the frozen fruit juices, especially orange and grapefruit juice, and canned tomato juice are comparatively inexpensive sources of vitamin C all the year round In the southeastern section of the United States, the frequent use of greens with their accompanying "pot liquor" provides a considerable source of calcium and vitamin C in the diet. Carrot

gional food patterns, to which the prenatal diet may have to be adapted.

COMPLICATIONS OF PREGNANCY INVOLVING DIET

Vomiting of Pregnancy. During the first trimester of pregnancy there may be trouble with nausea. Certain foods, which previously have been eaten without difficulty, now may cause distress. Fats are a common cause of upset Fluids taken with meals may also precipitate vomiting. Dry toast or a few unsalted crackers eaten before arising may be of help Fluids should be drunk between meals, not with the meal. Skim milk may be tolerated better than whole milk Vomiting, if it persists and becomes pernicious, should be treated by a physician

logic adjustments By this time her total blood volume has increased considerably to provide for the placental circulation. This may not be accompanied by

anemia of pregnancy

True anemia occurring during pregnancy is due most often to an iron deficiency Frequent pregnancies, depleting the mother's store of iron, may be a factor. Usually, however, anemia occurs in mothers who have an inadequate food intake, particularly of protein. Iron medications will aid greatly in restoring the hemoglobin to normal levels in these patients, but it is essential that the diet be investigated and corrected at the same time or other deficiencies may appear

treated while nursing, the infant will re-

[11] Spies, T D, *et al.* J.A.M.A. 149, 1376, 1952.



Fig 37 The desirable outcome of pregnancy: a healthy, happy mother and baby. (The New York Hospital)

superior rating and to maintain the mother's health at an optimum While modifications of the diet may be necessary at the various stages of pregnancy, the plan for the day's menu on page 145 can be followed with minor variations throughout most of the period.

Adaptations for Cost and Food Habit Patterns. It may be difficult for the mother to follow the suggested diet pattern if she has a strong dislike for a food such as milk or liver, if her food habits are culturally very different, or, most frequent of all, if the cost of the diet is higher than she can afford However, some adaptations can be made without impairing the nutritive value of the diet too greatly. The use of dried *skim milk* for part or all of the whole milk will lower the cost substantially. The use of chocolate and coffee flavor, a dash of vanilla extract or of cinnamon or nutmeg may change the taste of milk sufficiently so that the mother will drink it. Milk, either fluid or dried, may be used in desserts, creamed soups and scalloped dishes As has already been indicated, a 1-oz. slice of Cheddar (hard) cheese has approximately the same protein and calcium content as an 8-oz glass of milk. This may be an acceptable substitute for Italian patients, who use cheese somewhat more readily than large quantities of milk. Liver, an-

On page 148 there will be found a comparison of the recommended diet for pregnancy for a woman of normal weight, containing approximately 2,400 calories, and the restrictions necessary to bring this down to 1,800 and 1,500 calories. All these meet the Recommended Dietary Allowances for specific nutrients, except for calories, in the latter two diets.

Toxemia of Pregnancy. The cause [illegible]

stage there may be convulsions and coma. There is considerable controversy over the influence of nutrition on the development of toxemia. Toxemia seems to occur more frequently in pregnant women on poor diets, and particularly on low protein intakes, than in corresponding groups on good diets. Burke's findings[13] show that 44 per cent of the women on poor or very poor diets, 8 per cent on fair diets, and none on good or excellent diets developed symptoms of toxemia. Tompkins and Wiehl[14] have [illegible]

term), were not able to relate nutritional status to the health of the mother during pregnancy as clearly as other in-

[13] Burke, B. S., and Kirkwood, B. B. Am. J. Pub. Health 40:960, 1950.
[14] Tompkins, W. T., and Wiehl, D. G.: Am. J. Obst. & Gynec. 62:898, 1951.
[15] McGanity, W. J., *et al.* Am. J. Obst. & Gynec. 67:501, 1954.

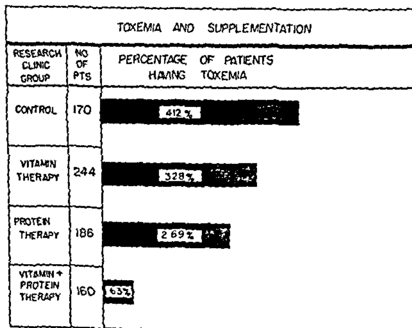


Fig. 38. (Tompkins, W. T., and Wiehl, D. G. Nutritional deficiencies as a causal factor in toxemia and premature labor, Am. J. Obst. & Gynec. 62:898, 1951.)

DIETS FOR PREGNANCY VARYING IN CALORIC CONTENT*

	2,400 CALORIES	1,800 CALORIES	1,500 CALORIES
Milk	1 qt. whole	1 qt whole	1 qt skimmed
Meat, fish and poultry	4 ozs.	4 ozs lean	4 ozs lean
Eggs	1	1	1
Fruit	2 servings citrus, 1 other	2 servings citrus, 1 other	2 servings citrus, 1 other
Vegetables	4 servings, including potato and dark green leafy or yellow vegetable	4 servings, including potato and dark green leafy or yellow vegetable	4 servings, including potato and dark green leafy or yellow vegetable
Bread and cereals	4 servings whole grain or enriched	4 servings whole grain or enriched	4 servings whole grain or enriched
Butter or margarine	3 teaspoons	3 teaspoons	3 teaspoons
Other foods	Sugar, desserts, fat for cooking; other foods to meet caloric needs	None. Saccharin or Sucaryl may be used for sweetening	None Saccharin or Sucaryl may be used for sweetening.

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Recommended Dietary Allowances of the National Research Council for pregnancy with the exception of calories for the 1,800 and the 1,500 calorie diets.

ceive enough folic acid from its mother's milk to restore its blood components to normal

Overweight in Pregnancy. Pregnancy usually is a time of well-being

during delivery, and, even more serious, there is an increase in the incidence of toxemia in overweight women

If the mother is overweight or has a tendency to gain weight easily, such foods as sugar, candy, jelly and other sweets, oil salad dressings, fried foods, fatty meats, cake and pie desserts, and carbonated beverages should be limited or omitted entirely. It will be necessary to limit bread and potatoes to the 5 servings allowed. If still further caloric restrictions are considered to be necessary, skim milk may be substituted for whole milk. As was pointed out earlier in the chapter, the protein in the diet may be utilized for energy instead of for growth if the calories are limited too severely. Oldham and Sheft[12] have shown that this occurs when the diet is below 1,500 calories, even when the protein intake is adequate Probably no diet in pregnancy should fall below 1,500 calories, and it may be more realistic to allow the mother an 1,800 calorie diet. If she adheres to this, there should be no impairment of her health or of the baby's, and her weight gain should remain at a minimum.

[12] Oldham, H , and Sheft, B B J. Am. Dietet A 27 847, 1951, Bull Matern Welf. 4 10, 1957.

*Sample Menu for a Day for a Lactating Mother**

Breakfast	*Noon Meal*	*Supper or Luncheon*
Stewed prunes Shredded-wheat cereal with milk (sugar if desired) Scrambled eggs Toast with butter or fortified margarine Milk Coffee if desired	Tomato juice Baked ham Scalloped potatoes Green beans Raw carrot sticks Whole-wheat bread and butter or fortified margarine Cup custard Milk. Coffee or tea if desired	Cream of pea soup Tomato and cottage cheese salad Biscuit with butter or fortified margarine Apple sauce Gingerbread Milk. Coffee or tea if desired
Midmorning Lunch	*Midafternoon Lunch*	*Before Retiring*
Milk	Orange or grapefruit juice	A glass of milk

* Adaptation from Federal Security Agency, Children's Bureau The Child 9.169-171, 1945.

Dietary Requirements. The nursing woman producing approximately 850 cc. milk daily, requires 1,000 additional calories above her normal needs, not only for milk production, but also for the extra activity necessitated by the care of the baby. Besides the increase in energy requirement, there are also increases in the requirements of protein, minerals and vitamins (*see* p. 142). Milk should be increased to 1½ qts., and the remainder of the diet should continue to be that prescribed for pregnancy. Some source of vitamin D may be included at the direction of the physician. [illegible] clude all the necessary foods. Plenty of water as well as other liquids should be taken. A typical sample menu for a day is shown above.

It should be remembered that the mother must return to a normal food intake when she weans the baby from the breast or she will gain excess weight

STUDY QUESTIONS

1 Even the normal healthy woman who has been taking an adequate diet will require more dietary essentials during pregnancy Review Recommended Dietary Allowances of the Food and Nutrition Board of the National Research Council for women in various activities. Which allowances increase in ratio to the caloric allowance? What other essentials should be increased during pregnancy?

2 What do nutrition studies show of the adequacy of diets in pregnancy of large groups of women in the United States? What is the role of the nurse in the correction of this situation?

3. Discuss the results of an inadequate intake of protein. In what forms may extra protein be added to the diet?

4. The mineral requirement is naturally larger during pregnancy How may the calcium and the phosphorus requirements be fulfilled? What are the food sources of iron? How may the iodine requirements be met?

5 List the foods and the quantity of each that must be included daily in the diet of the pregnant woman.

6. Plan a menu for a day for a healthy

vestigators, they do report an increased incidence of toxemia in mothers who ate less than 1,500 calories and 50 Gm. protein per day during the last trimester All these findings reinforce what was said at the beginning of this chapter: we have not so far made nutrition education in pregnancy as effective a tool as we might in maintaining the health of the mother during this period and ensuring a healthy infant at birth.

Once toxemia has occurred, the dietary treatment of it varies, depending on the severity of the symptoms. In the early stages, a diet high in protein, minerals and vitamins and low in sodium may best meet the needs of the patient. If the mother is markedly overweight, the calories should be restricted Suggestions for the restriction of sodium and calories, while maintaining the protein intake, will be found in the table on page 148. See Chapters 27 and 50 for suggestions for making the low-sodium diet more palatable

Cardiac Disease and Pregnancy. It needs to be remembered that the nutritional requirements of the pregnant woman with cardiac disease are the same as those of the noncardiac pregnant patient. If it is necessary to limit the mother's salt intake, note the sug- [illegible] for moderate sodium restriction [illegible] for patients being cared for in the hospital. See Chapters 27 and 50 for suggestions for making the low-sodium diet more palatable

Diabetes and Pregnancy. Again the [illegible] be increased to meet [illegible]

ther discussion of pregnancy and diabetes see Chapter 22.

DIET DURING LABOR

During the early part of the first stage of labor there need be little variation from the usual diet if the patient can take food *without digestive disturbance.* During the latter part of the first stage, food should consist mainly of carbohydrates, as they leave the stomach quickly. Protein and fat tend to remain in the stomach considerably longer, which may result in aspiration if anesthesia is given The diet may be soft or liquid and will include white-bread toast with jelly, soda crackers, canned or cooked fruits, gelatin, fruit juices, ginger ale, broth and tea or coffee with sugar but no milk or cream. Some obstetricians prefer that no solid food be given after the mother is in active labor because of the danger of vomiting and aspiration of food into the trachea.

DIET FOLLOWING DELIVERY

A liquid diet usually is given for the first meal after delivery. After that, there is a return to the normal diet If the mother nurses the baby, there must be an even greater allowance of food than there was during pregnancy.

DIET IN LACTATION

Lactation makes even greater demands in some respects upon the maternal organism than does pregnancy. After birth the child still must be fed *from the mother's body,* the food now being produced by the mammary glands instead of being supplied through the blood stream, as before birth As the baby gains in weight and becomes increasingly active, the food supply from the mother must increase.

Supply of Mother's Milk. A normal infant will consume daily 2½ ozs of mother's milk for each pound of his weight. An 8-lb infant will consume approximately 20 ozs, while a 15-lb. baby will consume about 30 ozs Since human milk has a caloric value of 20 calories per oz., it will be seen readily that a nursing mother must supply several hundred additional calories per day as food for the infant.

Breast Feeding
Formula Feeding
Digestive Disturbances of Infancy
Weaning
Feeding Premature Infants
Formulas: Types and Preparation
Supplementary Foods
The Infant Diet
Weight Gain

CHAPTER THIRTEEN

Nutrition During Infancy

There are many evidences that the earliest experiences of the newborn baby are of great importance in his later adjustment to the world in which he

portance than whether he is breast or formula fed If the mother is relaxed and confident, the baby will respond to her and, through her, to the world about him with trust and confidence. Conversely, if the mother is tense and over-anxious, or if the feeding is hurried, the baby becomes aware of discomfort. In response, there may be fretfulness or crying, which may prevent his taking the food he needs.

A mother should be encouraged to breast-feed her baby, but she should not be made to feel guilty if she prefers to bottle-feed him If he is cuddled and made comfortable when he is being fed, whether by breast or by bottle, his feelings will be those of warmth and comfort, and he will be able to establish warm, comfortable relationships with those about him.[1]

BREAST FEEDING

mother's breasts produce the first few days) Breast milk is pure and is not likely to cause intestinal infections Moreover, breast-fed babies are less

[1] Infant Care, Children's Bureau, U. S Dept. of Health, Education and Welfare, Publ. No 8, 1955.

pregnant woman of average weight. Make necessary modifications for a woman who is underweight; for one who is overweight; for a patient with a limited income.

7. Using Chapter 11 as a guide, write a menu for a day for a pregnant patient with a food pattern not typically American Be sure that it is adequate for the needs of pregnancy.

8. During the first trimester there may be trouble with nausea. How may the menu be modified to relieve this?

9. If for any reason the quota of fluid

which may be used in the menu.

10. During the latter part of the second trimester, the pressure of the enlarged uterus may cause constipation. How will you advise the mother? (*See* Chap. 24.) Why should mineral oil not be used?

11. During the third trimester toxemia may appear. Is there anything to indicate that diet may act as a preventive? If so, state the evidence.

12. How may the diet in pregnancy be restricted in sodium?

13. Lactation makes greater demands upon the mother than does pregnancy. What food increases should be made to stimulate the supply of milk? Which

adequate to it in every respect.

See Bibliography in Part Four for other pertinent material on the topics discussed in this chapter.

not be when he is going to sleep after-

the mother may have to be prepared to make up 10 or 12 bottles of formula, but, like the breast-fed baby, he will set his own schedule within the first 2 or 3 months. It should be noted that it is not safe to re-use a formula that is left over.

Weight Gain. It is now recognized that each baby will establish his own

right amount of food. (For average weights see the height-weight charts, Table 9, Part Four.)

DIGESTIVE DISTURBANCES OF INFANCY

Colic. Colic arises from cramps in the intestines, which cause the baby real

almost never constipated. A formula-fed baby will have fewer stools than a breast-fed baby, perhaps one a day or even less. So long as the movement is soft, there is no cause for worry. If the stool becomes hard, the doctor may make a slight change in the formula.

Diarrhea. Loose stools may be serious, and the doctor should be consulted at once. See Chapter 33 for diseases in which diarrhea is a symptom.

[4] *Ibid.*



Fig. 39. Feeding time should be enjoyed by both mother and baby, whether he is breast- or formula-fed. (Children's Bureau photograph by Philip Bonn)

WEANING

The average breast-fed baby is weaned between the 7th and the 10th months.[5] He has been drinking water and orange juice from a bottle, and should have begun to learn to drink small quantities from a cup when he was from 4 to 5 months old. If he is drinking well from a cup when weaning is begun, there may be no need of interim bottle feeding. Some babies, however, will continue to want to suck, and having a bottle once or twice a day will give him a chance to continue sucking. At this age he may be changed directly to whole milk, whether he is taking it from a bottle or a cup.

A bottle-fed baby is not ready to change to cup feeding as early as a breast-fed baby. However, some of the formula milk may be given in a cup as early as the 5th or the 6th month in order to accustom the baby to its use.

[5] Spock, B.: Baby and Child Care, New York, Duell, 1957.

for the mother to eat properly if she is going to produce this quantity of milk:

	Gm	Ozs.
1st day	10	⅓
2d day	90	3
3d day	190	6⅓
4th day	310	10
5th day	350	11⅔
6th day	390	13
7th day	470	15⅔
3d week	500	16
4th week	600	20
8th week	800	26⅔
12th week	900	30
24th week	1,000	33

The thick, yellowish fluid which appears the first few days of nursing is called colostrum. It will nourish the baby until the milk comes a few days later. The baby should be laid beside the mother with his cheek close to her breast He will turn his head toward the breast trying to find the nipple, and the mother can help him by holding the

and she will be able to satisfy his needs with an ever-increasing supply as he keeps on growing At first the baby may be satisfied after he has emptied only one breast, but if he does not give signs that he is full, he should be given the other breast. He should be started on this breast at his next feeding, so as to be sure to empty it[2]

If the baby is not getting enough to satisfy his hunger from the breast feeding, the doctor may prescribe an addi- [illegible] to be given after

occasionally to skip a breast feeding, and in such case a formula feeding may be substituted.

In some circumstances it may be advisable to substitute bottle feeding for breast feeding, even when the mother has an adequate supply of milk. According to the Children's Bureau, this would be in case of another pregnancy or the development of chronic illness or severe long-lasting infectious disease in the mother.[3]

"Burping" the Baby

Once or twice during a feeding, the

the air.

How Often To Feed

Much has been said in recent years about so-called "self-demand schedules of feeding." For many years babies were fed by the clock, regardless of whether they were hungry earlier or later than the scheduled time Today we recognize that when a baby is hungry, that is the time to feed him, whether the interval is 2, 3, 4 or even 5 hours. A newborn baby may wake to be fed 10 or 12 times in 24 hours. By the time he is a month old, there may be 3 hours between feedings. Most babies establish themselves on a schedule of 4-hourly feedings by the time they are between 2 and 3 months old. During this time, too, the baby will begin to sleep through the night after a late evening feeding.

FORMULA FEEDING

If the mother is feeding her baby by bottle, she should hold him as though she were breast-feeding him, cradled in her arm (*see* Fig. 39), in order to give him the same sense of nearness and companionship. It is important that she feel relaxed and unhurried, and that she enjoy this time with her baby. She should never allow him to eat by himself by propping the bottle up beside him. In this way his nutritional needs will be met but not his need for love and contact.

[2] McClure, *M H: Am J.* Nursing 57 1002, 1957.

[3] Infant Care· *Op. cit*

INITIAL FEEDINGS EVERY 3 HOURS FOR INFANT OF 1,500 GM.
(Gordon in Dunham, Ethel C : Premature Infants, A Manual for Physicians, ed. 2, New York, Hoeber-Harper, 1955)

AGE	5% GLUCOSE (cc per feeding)	WATER (cc per feeding)	FEEDING MIXTURE (cc per feeding)	TOTAL FLUID (cc per Kg 24 Hrs)	TOTAL CALORIES (per Kg. 24 Hrs.)
0–12 hrs	0	0	0	20*	*
12–24 hrs	8	0	0		
24–36 hrs	8	0	4	75	30
36–48 hrs.	8	0	8		
3, 4, 5 days	0	8	12–16	105–135	50–70
6, 7 days	0	5	20–25	135–160	85–105
8 days	0	0	30	160	125

* During the first 24 hours no particular attention need be paid the total fluid or the total caloric requirement.

than human milk, and this calcium seems to be more readily absorbed. This is another reason for favoring cow's milk for premature infants. Iron storage is usually incomplete, and it may be necessary to give either an iron medication or a blood transfusion to prevent the development of an iron-deficient anemia.

There is greater need of vitamins in [illegible]

[illegible] of the vitamins usually found in milk for the needs of the rapidly growing premature infant Moreover, low-fat cow's milk will contain less vitamin A than full cow's milk Defective fat absorption will interfere with the absorption of vitamins A and D Therefore, these two vitamins will have to be added in larger amounts than usual and in concentrate form miscible in water Vitamin C also needs to be supplied to [illegible]

when orange juice may be substituted There is some indication that supplements of the B complex vitamins are also desirable.

Because the sucking or swallowing reflexes may be sluggish, a very small premature infant may be fed entirely by gavage until he is capable of taking a formula A somewhat larger baby may be fed with a medicine dropper covered with rubber tubing until he is able to suck. As soon as premature infants are found to suck well, they should be fed by bottle.

FORMULAS: TYPES AND PREPARATION

Milks Used in Infant Feeding. Cow's milk usually is chosen because it can be modified easily to resemble the composition of human milk, and a safe supply is generally available. Fresh pasteurized, canned evaporated or dried whole milk powder may be used in the preparation of a formula.

The choice of the type of milk for infant feeding will be determined by circumstances Sometimes a safe, dependable fresh milk supply is not available, or home refrigeration is inadequate. Evaporated milk is distributed widely and will keep without refrigeration until the can is opened, after which it must be stored in a cold place, as is the case with fresh milk. Dried milk also will keep without refrigeration until the can is opened, but it must be kept covered and cold afterward. Some physicians prescribe canned milk for the formula, even when a supply of fresh milk

COMPOSITION OF MILK MIXTURES FOR FEEDING PREMATURE INFANTS DESIGNED TO PROVIDE 120–130 CALORIES PER KG. OF BODY WEIGHT

(Gordon *in* Dunham, Ethel C.: Premature Infants, A Manual for Physicians, ed. 2, New York, Hoeber-Harper, 1955)

MILK MIXTURE* (PER KG.)	PROTEIN		FAT		CARBO-HYDRATE		CALORIES	
	Gm.	Per Cent of Calories	Gm.	Per Cent of Calories	Gm.	Per Cent of Calories	Total	Per cc.
For smaller premature infants, less than 2,000 Gm (4 lbs. 7 ozs.)								
Half-skimmed milk, 150 cc, plus sugar, 15 Gm (approximately 10% added)	5.3	16	2 6	18	21 8	66	132	0 9
Half-skimmed milk, powdered, 18 Gm, plus sugar, 11 Gm, plus water to make total of 150 cc	6 0	20	2 2	16	19.4	64	121	.8
For larger, more mature infants, 2,000–2,500 Gm. (4 lbs. 7 ozs –5 lbs 8 ozs):								
Evaporated milk, 70 cc, plus sugar, 6 Gm, plus water to make total of 150 cc.	4 8	16	5.5	41	12 9	43	120	.8
Human milk, 180 cc.	2 2	7	6 7	50	12 9	43	121	.7

* Acidification of milk with lactic acid is recommended for premature infants by some authorities Theoretically, it would be indicated because of the tendency for these infants to have low gastric acidity. Practically, lactic acid milk has the advantage of keeping for 24 hours without refrigeration

At first he will take only a few sips, and he should be allowed to have most of his fluids by way of the bottle When he [illegible] to take a good deal of milk from

is being deprived of an important source of pleasure and comfort.

FEEDING PREMATURE INFANTS

The premature infant needs more care in every respect than does a full-term baby. The sucking and the swallowing reflexes may be absent or sluggish, the capacity of the stomach is small, the gastric acidity is low, the absorption of fat is poor, and the digestive enzyme system is incompletely developed. Human milk was long considered to be the ideal food for premature infants, and today many physicians continue its use by asking the mother to express her milk from the breasts while the baby still is being cared for in the hospital. However, it has been found that a high-protein, low-fat cow's milk formula will ensure as good and sometimes better weight gain and development in these infants than does human milk, and it is far easier to obtain.

Because of the incomplete antenatal storage and the demands of rapid growth, the premature infant has greater need of calcium, phosphorus and protein than has the full-term infant. Cow's milk has a much higher calcium content

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(*Cordon in* Dunham, Ethel C *Premature Infants, A Manual for Physicians*, ed 2, New York, Hoeber-Harper, 1955)

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36–48 hrs	8	0	8		
3, 4, 5 days	0	8	12–16	105–135	50–70
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may be very small and will not supply sufficient of the vitamins usually found in milk for the needs of the rapidly growing premature infant. Moreover, low-fat cow's milk will contain less vitamin A than full cow's milk. Defective fat absorption will interfere with the absorption of vitamins A and D. Therefore, these two vitamins will have to be added in larger amounts than usual and in concentrate form miscible in water Vitamin C also needs to be supplied to premature as well as to full-term infants. Usually, the synthetic form is given until the baby has gained full-term status, when orange juice may be substituted There is some indication that supplements of the B complex vitamins are also desirable

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is available, as they consider it to be more satisfactory. It is possible to obtain each of these milks fortified with vitamin D.

In processing canned and dried whole milk, the fat is blended thoroughly with the other milk solids When fresh whole milk is used for the formula, the physician may advise the use of the homogenized type, in which, during the process of preparation for the market, the cream is thoroughly blended and distributed throughout the milk.

Special Forms of Milk. Under some conditions a pediatrician may advise the use of a lactic acid milk. This may be obtained in dried form, or it may be prepared either by adding lactic acid or a culture to cool boiled milk. Cooling is important before the acid is added,

by the use of partially skimmed milk, may be advised. Naturally, changes of this kind are made under supervision of the physician.

Goat's milk is used sometimes in

it must be prepared for infant use in much the same fashion as cow's milk.

Milk Substitutes. Certain infants are born with a sensitivity to the proteins of all milk. This may be mild enough to cause only irritability, or it may be severe enough to cause violent illness and even death Several preparations

These contain no milk at all. Soybean preparations are used most commonly Usually, the protein in the soybean can be taken by infants allergic to the pro-

	Cow's Milk Per Cent	Goat's Milk Per Cent	Human Milk Per Cent
Protein	3.5	3.3	1.4
Fat	3.9	4.2	3.7
Carbohydrate	4.9	4.8	7.2
Minerals	0.7	0.7	0.2
Water	87.0	87.0	87.5

adequate nutritionally for such infants If these types of "milk" are properly supplemented, infants do as well on them as on other bottle feedings.

Sugars Used in Formula Making. Cow's milk is adapted to the needs of an animal that reaches maturity in a few months, while the human offspring does not reach maturity for some years. Therefore, it is to be expected that cow's milk will be richer in body-building materials than human milk. By analysis, it is found to be richer in protein and in the mineral salts but less rich in milk sugar. (*See* table of comparison on this page.) For this reason it is commonly "modified" by dilution with water and the addition of some form of sugar. This may be granulated sugar (sucrose), corn syrup or malt sugar (dextrimaltose). Physicians differ as to the choice of carbohydrate, but sugar and corn syrup are used most often because they can be found at the grocery store and are easy to use. The amount to be added is calculated according to the total number of calories required for 24 hours. The milk used in the day's formula will supply most of the calories, the difference being made up by the addition of carbohydrate Then water will be added to meet the fluid requirement and to dilute the protein

Nutritional Needs To Be Met by the Formula

The protein requirement for children is much higher per kilogram of body weight than for adults, because of the added needs for growth. Whereas the adult allowance is 1 Gm. of pro-

	Calories/Kg / of Body Weight/24 Hrs
Basal metabolism	60
Activity	25
Growth	30
Loss in stools	5
Total	120

tein per Kg, the infant will need about 2 Gm. of human milk protein or from 3 to 4 Gm of cow's milk protein per Kg of body weight. The difference is due to the fact that the amino acids of human milk protein are more closely adapted for human infant needs than are those of cow's milk protein.

The energy requirement of infants also is much greater per unit of body weight than that of adults. The adult need for energy for a moderately active

infant has more active tissue and a greater body surface area for his weight than the adult, consequently, there is a greater heat loss. Additional calories are also needed for growth and activity The table above shows the distribution of the caloric needs of the infant.

The fluid requirement for young infants is about 150 cc., or 5 ozs., per Kg. of body weight in 24 hours. At first this usually is calculated into the formula, but later boiled water is given to the baby between his feedings.

Calculation of a Formula. We shall assume that we have a 3-month-old baby weighing 5 Kg, or 11 lbs, who is to be transferred from breast to bottle feeding. His needs will be as follows:

5 x 120 calories = 600 calories
5 x 3 to 4 Gm protein = 15 to 20 Gm. protein.
5 x 150 cc fluid = 750 cc. fluid, or 25 ozs

If we look up the protein content of milk, we shall find that it contains 3½ Gm of protein and 70 calories per 100 cc. Therefore, if we use 600 cc., or 20 ozs, of milk, we shall obtain 21 Gm. of protein and 420 calories. The protein is slightly higher than the required amount of 15 to 20 Gm., but this is acceptable for the fast-growing infant. Since we need a total of 600 calories, we shall need 45 Gm., or a scant 4 level tablespoons, of sugar, which at 4 calories per Gm. will yield the remaining 180 calories Water (150 cc, or 5 ozs.) will be added to bring the total fluid up to 750 cc. At 3 months, this probably would be given in 5 feedings of 150 cc., or 5 ozs, each feeding.

The amount of formula for the baby will be increased gradually, first by the week and then by the month, throughout the period of bottle feeding. To meet the needs for growth, the doctor will change the formula in the first weeks, then it probably will be standardized, except for an increase in quantity.

The lower infant mortality rate and the larger number of well babies are attributed in large part to the great advances made in the last decades in methods of feeding, especially among infants who must be fed artificially. The simplification of the formula and the early supplementation of milk with other foods deserve much credit. However, Mitchell[6] states "Perhaps the most significant improvement in artificial feeding of infants is the reduction of bacterial contamination. Sterilization of the formula at the time of preparation and the subsequent storage of it so that bacterial contamination is avoided have been major factors in reduction of morbidity and mortality of gastro-intestinal infections during the first era of life."

[6] Mitchell and Nelson: Textbook of Pediatrics, ed. 5, Philadelphia, Saunders, 1950



Fig. 40 Technic for preparing the formula. *(Top, left)* Equipment needed *(Top, right)* Testing nipple after washing. *(Center, left)* Scalding can. *(Center, right)* Ingredients for formula. *(Bottom, left)* Measuring water. *(Bottom, right)* Measuring sugar. *(Continued on facing page)*

How To Make the Formula

T[illegible]

should be instructed carefully. The procedure will depend to some extent upon whether the milk is in fresh, canned or dried form. In every case, however, the cleanliness of bottles, nipples and utensils used during the making of the formula must be stressed The care of the filled bottles for the 24-hour allowance, which is usually made up at one time, is the same, whatever type of milk is used.

Feeding Equipment

Nursing bottles of heat-resistant glass or of boilable plastic cost more but

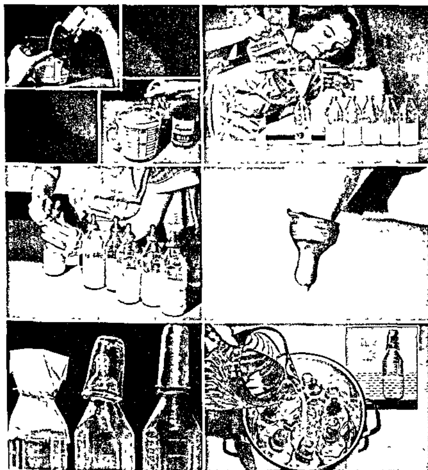


Fig 40 *(Continued)*. *(Top, left)* Measuring milk *(Top, right)* Filling the bottles. *(Center, left)* Putting on nipples *(Center, right)* Testing nipple for flow. *(Bottom, left)* Paper, glass and aluminum caps *(Bottom, right)* Bottles on rack, ready for sterilization

probably are less expensive in the long run than others. Bottles should be of a shape easy to clean with a bottle brush A dozen 8-oz. bottles for holding formula is a good supply with which to start. A few 4-oz. bottles may be included for water and orange juice.

Nipples. There should be a sufficient number of nipples for use during 24 hours

Nipple Caps These may be of glass, plastic, aluminum or paper The last are inexpensive but can be used only once

Cleaning. After each feeding, bottles and nipples should be rinsed, scrubbed with a detergent and water, using a

bottle brush, then rinsed again thoroughly with warm clean water.

Formula-Making Equipment

A set of utensils[7] should be reserved if possible, especially for preparing the formula These should include:

A kettle for sterilizing the bottles.

A wire rack, or a pie tin (upside

the sides

A set of measuring spoons.

A measuring cup, marked in ounces, with a pouring lip.

A large saucepan in which to mix the formula, with a lip to make pouring easy.

Method II).

A funnel makes it easier to pour the formula into the nursing bottles, but if your saucepan has a lip that pours well, you may be able to get along without

cover, for used nipples.

Bottles to hold a 24-hour supply of formula.

Nipples and nipple caps.

A pair of tongs is convenient.

preparation, such as lactic acid milk formulas. Its great advantage is its ease of use and the elimination of possibilities for contamination of the formula. The method is recommended by the American Hospital Association and is required by law in all hospitals in some states.

[7] Infant Care. *Op cit.*

There are many advantages for home use also The procedure is as follows:

Thoroughly clean the table surface, or other work area, and the hands with soap and water.

of can with soap and water, and rinse with boiling water.

Collect ingredients to be used for formula.

Measure required amounts of water,

small amount of formula is left, add a little to each bottle

Put a nipple on each bottle and test the flow of milk.

Cover the nipples loosely with the nipple caps, no matter what type of bottle and cap is used.

kettle is deep enough, or invert another kettle of the same size over it, in order

Cool to room temperature and place in refrigerator.

Preparation of Equipment and Formula Using Sterile Technic. Sterilization of equipment should be done as follows:

FORMULA PREPARATION WITH STERILE TECHNIC

FRESH MILK	EVAPORATED MILK	DRIED MILK
Take bottle or carton of milk from the refrigerator Wash top under running water and wipe with towel (unless there is an extra protecting bottle cap). Shake bottle and measure required amount of milk into saucepan Measure and add required amount of water. Measure and add required amount of sugar or syrup into mixture and stir Bring to boil and boil 5 minutes, stirring constantly.	Measure required amount of water into saucepan Add required amount of sugar or syrup. Stir until dissolved Bring to boil, boil 5 minutes and remove from heat *Scald top of can of evaporated milk by dipping it into boiling water or pouring boiling water over it* Open can of milk, measure required amount into saucepan with other ingredients. Stir to mix.	Measure required amount of cold water and place in saucepan Add required amount of dried milk to water (Use dry measuring spoon and level with knife) Beat with egg beater until milk and water are blended thoroughly Measure required amount of sugar into mixture and stir. Bring to boil and let boil 5 minutes while stirring constantly

[illegible]

[illegible]

drain.

[illegible]

The procedure for the preparation of fresh milk, evaporated milk and dried milk formulas is given in the table above. Use the sterile equipment described, being careful not to contaminate it

Warming the Feeding. The following procedure should be observed.

Remove filled nursing bottle from refrigerator.

Place in small, deep saucepan of warm water or in bottle-warmer.

Place over high heat until water begins to bubble

Shake bottle occasionally so that milk will warm evenly

Remove bottle cap and apply nipple taken from covered jar, unless nipple was placed on bottle when formula was prepared Be sure not to contaminate the rim of the bottle or the nipple

Test temperature of milk by shaking a few drops on the inside of the wrist Milk should be warm but not hot.

SUPPLEMENTARY FOODS

The sequence in which new foods are added to the infant diet and the readiness with which the baby accepts them will vary Usually, there is little difficulty with vitamin A and D preparations, but the baby may balk at the sour taste of orange juice. The addition of a little sugar and dilution with water may make it more acceptable to him If he steadily refuses cereal, cooked strained fruits may be given first and cereal added a week or two later.

In an excellent article on the developmental growth of children, Rabino-

vitch[8] states: "Babies differ a great deal in their capacity to handle new foods, and many difficult situations have been created by a rigid adherence to a preconceived schedule There is no set time for the introduction of orange juice or solid food, and one is always wiser to respect the infant's developmental pace and to allow him to set the pattern."

In the following paragraphs, the authors have indicated the approximate age at which new foods may be introduced, but in the light of the above paragraph it can be seen that there may be a considerable variation in infants

Vitamin Supplements. Both breast-fed and artificially fed infants may need vitamin supplements as early as the 2nd to the 4th week. Vitamin D is particularly essential in temperate climates, where babies do not receive sufficient sunlight to ensure good bone development. Usually, it is prescribed for all babies, no matter where they live. The good bony structure and the fine, straight legs of most of our children today are the result of the early feeding of vitamin D.

Fish-liver oils are one of the oldest and best-known sources of this vitamin. There is wide variation as to the amount of vitamin D in the various oils, hence, the quantity prescribed depends upon the strength. 400 I.U. a day is the dosage recommended by the Food and Nutrition Board of the National Research Council.[9]

Fish-liver oils are also excellent

well-being.

By the time the baby is 3 or 4 weeks of age, orange juice is added to supply vitamin C, in which milk is very low. It should be diluted at first with an equal quantity of cool, boiled water and given once a day, beginning with 1 teaspoonful, and gradually increasing to 2 tablespoonfuls twice daily by the end of the third month. Mothers should be warned that orange juice must not be heated or boiled, or the vitamin C will be destroyed The great care necessary in preparing a formula is due to the fact that milk is a good culture medium for bacteria.

If the baby is allergic to orange juice, or if there is considerable difficulty in getting him to take it, the synthetic vitamin ascorbic acid may be substituted.

Cereals. The baby should be introduced to cereals when he is 2 to 3 months old. Dry, precooked cereal preparations and canned cereals especially prepared for infant feeding are available. Because milk is low in some of the essential nutritional factors, many doctors advise the use of fortified cereals to

mixed with warm formula or whole milk,
while the others need only be warmed

cooking. The coarse cereals must be strained, and all of them should be thinner than those prepared for the family. Only a small amount of cereal should be used at first, and this generally is given with the midmorning feeding The original small amount may be increased gradually, and in a few months it may be of a thicker consistency. By the 7th or the 8th month, the baby will be taking from 2 to 5 tablespoonfuls twice during the day.

Fruits. Cooked, strained fruits and ripe banana may be added to the baby's diet when he is 3 to 4 months old. Like cereals, these may be purchased in cans or jars, all ready for infant use, or they may be prepared at home. Fruits should

8 Rabinovitch, R. D, and Fischhoff, J.: J. Am Dietet. A 28 614, 1952.

9 National Research Council Recommended Dietary Allowances, No. 589, 1953.

be cooked according to directions in Chapter 39 and put through a purée sieve or strainer. Strained apple sauce, prunes, peaches, pears and apricots are suitable. Ripe mashed banana, thinned out with a little milk, may also be given *Starting with a teaspoonful once or* twice a day, the baby will soon take 2 to 3 tablespoonfuls. Most babies love fruit and take it readily. This helps them to accept other solid foods, the taste of which may not appeal to them quite so much.

Vegetables. By the 4th month, or even earlier, strained vegetables are usually introduced Those added first are peas, string beans, spinach, carrots, beets, tomatoes and squash. Fresh, frozen or canned vegetables are suit*able. If prepared at home, they should* be cooked in a small amount of water, as would be done for the family meal, and the baby's portion put through a purée sieve or a strainer. Again, these and other varieties of vegetables are available in cans or jars in most grocery stores prepared and ready for serving



Fig 41. Signs of good nutrition *Note the straight back, well-developed body, alertness and good coordination of this child.* (The New York Hospital)

be added a little later

Egg Yolk. Egg yolk is a valuable source of iron, in which milk is particularly low. By the time egg yolk is introduced at 4 to 6 months, the baby's store of iron with which he was born is pretty well used up by his increasing number of red blood cells. Fortunately, enriched cereals and many fruits and vegetables are also good sources of iron, and will contribute to his need for this mineral at about this time.

Eggs are a rather common source of allergy. *For this reason the yolk only is* given at first, as its protein is less allergenic than the white of the egg, and the egg white contains no iron. The egg is cooked hard by placing it in boiling

given by spoon, or mixed with cereal or

given by the time he is a year old

Meat. Meats may be added as early as 2 months or as late as 6 months, depending on the doctor's judgment about the baby's need for them. The most convenient way of serving meat to the baby is by way of the canned, strained beef, beef heart, liver, lamb, chicken, veal and pork preparations available in cans and jars at most grocery stores. To prepare meat for the baby at home, the mother should buy a lamb chop or a slice of

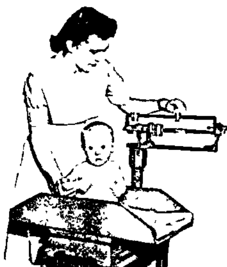


Fig. 42. The rate at which a child gains weight is dependent on many factors. As long as he gains weight and length steadily, and exhibits the other signs of good nutrition, there is no cause for worry. (The New York Hospital)

beef top round, wipe the surface with a clean damp cloth and scrape off the meat fibers with a tablespoon or a dull knife. The resulting meat pulp may be heated in a custard cup set in a small pan of water over a flame, until it is brown. Liver should be parboiled in water until it is brown, cut in small pieces and put through a sieve. A small amount of salt may be added for flavor to home-prepared meats and water or milk if the mixture is too dry. Salt has been added to the canned meats.

Meats add protein, iron and some of the B complex vitamins to the baby's diet. Again, it is best to begin slowly, with a teaspoonful or less, at the evening feeding, increasing the quantity as the baby grows older.

THE INFANT DIET

By the time they are 6 months old, most babies will be eating all the supplementary foods discussed so far. Besides this, they will be getting either the breast or formula feedings for their milk supply, and they will have started to take some fluids, especially orange juice and water, and perhaps milk, from a cup. A good meal plan for a baby of this age is to give him cereal and egg yolk at breakfast, vegetable and meat for lunch, and cereal and fruit for supper. The quantities will depend on his appetite. If there is a tendency to constipation, giving fruit at breakfast as well as at supper may help. Prunes are particu-

bread, toast or zwieback to hold in his hands and chew on, particularly if his teeth are beginning to appear. If potato has not already been given, it can be added at this time, mashed fine. It should be thinned out with milk at first until he is used to it. A piece of crisp bacon or a bit of raw, peeled apple is also often enjoyed by babies, when they are allowed to hold it in their hands and suck on it. Puddings made mainly with milk, such as junket, cornstarch, tapioca and rice pudding, may also be added occasionally for variety. A small piece of a white, non-oily fish, such as flounder, haddock or halibut, may be substituted for meat now and then. It should be boiled gently in water to cover until it flakes.

By the time he is 9 months old, it is time to try serving some of the baby's foods mashed with a fork instead of strained through a sieve. The change should be made gradually and should not be forced. Vegetables and fruits may be tried this way first. Meat had better be served strained until after the first year, because it is so much more difficult to swallow.

As the baby becomes acquainted with a variety of things, including his food, he will want to explore it with such tools

as he has at his command. To quote Rabinovitch[10] again: "In the second half of the first year, the baby will begin to mess with food, to feel its texture and consistency, to finger-feed himself as he recognizes his growing dexterity. Such experimentation, often difficult for the cleanliness-and-germ-conscious mother,

developmental realities goes without saying"

WEIGHT GAIN

The height-weight tables in Part Four will be found useful as a means of comparison in determining average normal gains and as a basis for computing nutritional requirements It needs to be

weight in 5 months.

During the second half of the first year the weight gain will be slower, but most babies will have trebled their birth weight at the end of the first year. The rate of gain will vary with the size of the parents, the sex of the baby—boys are a little heavier than girls—and the type of body build of the child

STUDY QUESTIONS

1. Why is breast feeding considered to be an advantage for both mother and baby?

2 What must the mother's attitude be if she bottle-feeds the baby?

3. In what circumstances should breast feeding be discontinued?

4. If breast milk decreases in quantity, what method is used to supplement it?

5. What foods in what quantity should be included in the mother's diet if she is nursing her baby? (*See* Chap. 12.)

6. The average baby is weaned between the 6th and the 9th months How should the baby be prepared for this?

7. The premature baby has nutritional problems not found in the full-term baby. What are some of these?

8. Which 2 types of milk are commonly used for premature babies? What are the advantages of each?

forms of cow's milk may be used, and what reasons may influence the choice?

10 In preparing the milk formula, there must be dilution and additions For what reasons? What are the additions generally used?

11. Babies are quite individual in their growth rates What warning should be given the mother about height and weight tables?

12. What is meant by self-demand feeding? Why have many doctors advised against a too-rigid feeding schedule?

13. Plan a formula and a feeding schedule for a baby 5 months old and weighing 14 lbs (6½ Kg).

14 Terminal sterilization is now in general use. What are its advantages? For which type of formula can it not be used? Give directions for preparing a whole-milk formula, including terminal sterilization

15 Give directions for making an evaporated milk formula, using sterile technic. What are the difficulties of this method of formula preparation?

16 The choice of the type of milk may depend upon circumstances Which type of milk would you suggest for a young mother traveling with a baby across the United States? Why?

[10] *Op. cit.*

17. Supplementary foods are introduced into the baby's diet gradually. What is the first supplement generally advised and in what amount? In what order are other foods introduced? Suggest reasons for their introduction. Plan a day's diet for a normal well baby 9 months of age.

18. How does the baby's growing dexterity and his need for exploration affect his food habits at this particular age?

See Bibliography in Part Four for other pertinent material on the topics discussed in this chapter.

Diet in Early Childhood
Elementary School Age
High School Age
Nutrition Studies of Children
The School Lunch Program
Nutrition Education
Evaluation of Growth and Nutritional Status

CHAPTER FOURTEEN

Nutrition for Growth

The influence of nutrition on the health, the growth and the development of the newborn baby and of the infant has been shown in the previous chapters Here we shall consider the nutritional needs of children and show how nutrition modifies growth and development and is, in turn, modified by environment.

Just as improvement in infant feeding practices has done much to promote the health of babies and to lower infant mortality, so our knowledge of nutrition has contributed toward the health and the well-being of all children Studies made of 9-year-old boys show that in the past 50 years in this age group there has been an increase of from 3 to 4 inches in height and of from 5 to 8 [illegible]

in growth and weight may contribute to the well-being of the individual for the rest of his life

Growth and Development. By growth we usually mean a physical increase in weight or height, or both, as the result of cell multiplication. Development is more difficult to describe and to measure it deals with muscle strength and co-ordination, with mental capacity and mental health, with attitudes and adaptations Nutrition affects growth, and it may also have a direct or an indirect influence on the development of the child Other factors which affect the child and, therefore, are interrelated with nutrition are the emotional, the economic, the social and the hereditary environment in which he finds himself

Rates of Growth Although growth occurs continuously from conception to full maturity, it is not a uniform process but consists of two periods of rapid growth separated by one of more or less uniform but slower increase The first [illegible]

cussed in earlier chapters. We shall now consider the needs of children following the period of infancy, when the growth curve slows down to a steady pace until

[1] From data collected by Boyd, J D: The Child 16 58, 1951

the second period of rapid growth is reached in adolescence.

DIET IN EARLY CHILDHOOD

The diet of the 1 year old differs only slightly from that described in the previous chapter. It will include 1½ to 2 pints of milk a day plus the supplementary foods already discussed. His vegetables and fruits will be mashed instead of strained, and he will have started on "finger foods," such as bread crusts, toast and zwieback, and an occasional piece of raw apple or carrot. He will have been introduced to the family 3-meal schedule with a midmorning and a midafternoon lunch of fruit juice or milk The cup will largely have supplanted the bottle, and he may have started to try feeding himself with a spoon

During the second year more solid foods will be added, such as finely chopped fruits and vegetables in place of mashed ones, ready-to-eat cereals as well as hot cereals, chopped liver, lean meat, fish and poultry instead of the strained variety Whole egg will have replaced egg yolk, and a child of this age is ready to eat 1 egg a day. Cottage cheese and mild American cheese, in combination with other foods, may be used occasionally, and butter or fortified margarine is used with toast or zwieback. He will also enjoy custard and simple puddings The 2 year old's food should be prepared simply, and most fried foods, rich pastries and cakes should be avoided Coffee, tea and soft drinks containing caffeine should not be given to young children.

Making foods easy to eat for beginners helps them to develop independence in feeding themselves and will pre-

into bite-size pieces can be managed either with fingers or with a spoon Bread and butter cut into strips are easy to hold and eat.

For the 3 to 5 year old the basis of the diet should remain the same, but the child should be introduced gradually to most of the foods on the family table He should be encouraged to drink ¾ to 1 qt. of milk a day. Some of this may be used in creamed soups and custards or other desserts included in his meals. Whole fruits and vegetables, both cooked and raw, should begin to appear on his menu. Meat should be cut in small pieces rather than ground. Bacon, if it has not been used earlier, often is a welcome addition. It needs to be remem-

cause it is too difficult to manage the food with them.

A midmorning and a midafternoon lunch should be continued for this age group if it does not interfere with the child's appetite at mealtime Milk, if not consumed at mealtime, or fruit juice, sometimes accompanied by bread, crackers or plain cookies, may be given. Rich cookies, cake and candy should not be eaten between meals but reserved, if used at all, for dessert at the end of a meal.

Establishing Good Food Habits

It is important that the child's training to establish good food habits be begun during the first year and continued through childhood. The meal hour should be one of peace and quiet

times of the day. It furnishes the occasion for the whole family to visit together

Children are great imitators, they will

Food That Will Meet Needs of Healthy Children from 1 to 6
(Your Child from One to Six, Children's Bureau, U S Dept of Health, Education and Welfare, Publ No 30, 1956)

Food	Approximate Quantity Needed Daily	Average Size of Serving for Each Age		
		1 Year	2 and 3 Years	4 and 5 Years
Milk, to drink and in or on foods	3 to 4 measuring cups	½ to 1 c	¾ to 1 c.	1 c
Eggs	1	1	1	1
Meat, poultry, fish, cottage cheese	1 to 4 tablespoons*	1 tablespoon	2 to 3 tablespoons	4 tablespoons
Potatoes, white or sweet	1 serving	2 tablespoons	3 tablespoons	4 tablespoons
Other cooked vegetables (mostly green leafy or deep yellow ones)	1 to 2 servings	2 tablespoons	3 tablespoons	3 to 4 tablespoons
Raw vegetables (carrots, cabbage, tomatoes, lettuce, etc)	1 serving	Small portion (such as ¼ medium-sized carrot)		
Fruit for vitamin C	1 medium orange or ½ cup citrus fruit juice or ¾ cup tomato juice	⅓ to ½ c	½ to ⅔ c	½ to ¾ c.
Other fruit (apples, apricots, bananas, pears, peaches, prunes, most berries, etc)	1 serving	¼ c	⅓ c	½ c
Bread, whole grain or enriched	1½ to 3 slices	½ to 1 slice	1 slice	1 to 1½ slices
Cereal, whole grain, enriched or restored	1 serving	¼ c	⅓ c	½ c
Butter or fortified margarine—spread on bread and used to season vegetables				
Fish-liver oil or vitamin D concentrate or vitamin D milk	400 units	(A quart of vitamin D milk contains 400 units)		

* One tablespoon means a level tablespoon A rounded tablespoon is equal to 2 level ones



Fig. 43. The right start for the baby. Liking comes through learning to like. Teach the flavor of a variety of foods early. (Gesell and Ilg Behavior of Infants, Philadelphia, Lippincott)

accept foods simply because daddy or mother eats them Therefore, parents should set a good example by including in their own diet foods known to be essential for good body-building Unfavorable comments regarding wholesome foods should be strictly avoided

A mother is often overly anxious about her child's food and displays this anxiety before him A child's appetite may vary, as does that of an adult. Because he does not drink his full quota of milk at one meal does not mean that the lack will not be made up at the next one There is much virtue in expecting the child to eat the things set before him, but a child who is scolded and made to feel that he is being coerced into eating certain foods is sure not to want them and more than likely will fight for his "rights" Undue nagging is responsible for many of the so-called food-problem children

If a child is to be offered some unfamiliar food, this should come at the early part of the meal while he is still hungry, and the food should be given in very small quantity If he rejects it, he should not be forced, but another trial should be made a week later.

Bribery is bad psychology, since a child soon learns to classify food unpleasantly, as with medicine. Tactfulness on the part of the mother is never more necessary than at a child's mealtime. As already stated, the most effective plan is to expect the child to eat the food set before him. Mothers who carry through successful food programs must have faith in their ultimate success.

Children differ greatly in their natural desire for food. Long-term studies such as those conducted at the Yale Clinic of Child Development emphasize this fact [illegible] preferences," which should be familiar to every mother, nurse or dietitian dealing with children For instance, "finicky" food habits and food jags are characteristic in the years from 2 to 4. The 5 to 7 year olds dislike casserole dishes, mixtures, fat meats and gravies They like raw vegetables better than cooked ones, but dislike strongly flavored cooked vegetables, the root vegetables especially being in disfavor.

Preferences also change with age and should be respected by mother or nurse. Nutritional requirements can be met in spite of this changing pattern with age. The 5 year old prefers plain food, such as meats, potatoes, raw vegetables, milk and fruit. By 6 or 7 he is willing to try new foods and to accept foods previously disliked. By 8 there is a ravenous appetite with few refusals but strong preferences Food may be judged by odor or color, and food served attractively makes an impression. By 9 the child usually has a keen interest in food, likes to help prepare it and is positive in his likes and dislikes. Some will eat everything at this age, but plain foods still are preferred Puréed foods and fat on meat continue to be disliked. The authors stress particularly the deep-seated growth reasons which seem to

[2] Gesell and Ilg The Child from Five to Ten, New York, Harper, 1946

underlie these changing preferences and refusals.

ELEMENTARY SCHOOL AGE

New problems with regard to the regular routine of feeding established in the first years may occur when the child enters elementary school. Contact with other children who have been allowed a greater variety of foods or are accustomed to eating sweets between meals may cause a child to question his own schedule, which up to then he had taken for granted. The excitement of new ex-

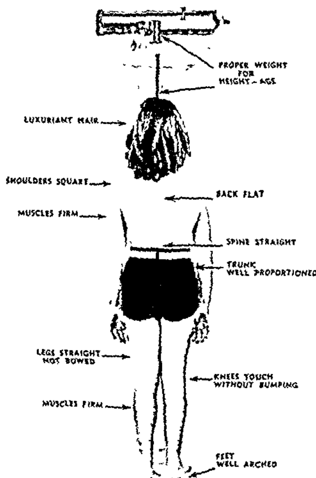


Fig 44 Healthy child, showing a well-built body (Sunkist Growers)

Caloric Consumption by Boys and Girls from 1 to 10 Years Old[4]

Age	Boys		Girls	
	Range	Mean	Range	Mean
	Cal.	Cal.	Cal.	Cal.
1	1017–1431	1224	996–1452	1224
2	1154–1682	1418	1159–1719	1439
3	1255–1829	1542	1294–1888	1591
4	1317–1973	1645	1334–1984	1659
5	1508–2176	1842	1368–2080	1724
6	1590–2274	1932	1526–2268	1897
7	1653–2399	2026	1583–2389	1986
8	1751–2589	2170	1661–2433	2047
9	1843–2847	2345	1719–2479	2099
10	1864–2792	2328	1706–2486	2096

periences may interfere at times with digestion and appetite, especially if a fear of being late is developed. It is important that there should be plenty of time for the eating of an adequate breakfast. This is true for lunch also, when there are two school sessions and the child comes home for this meal If he takes lunch to school and there are no

must take into consideration the type of midday meal which he has had. He may need an afternoon snack when he returns from school, but it should not be of such a nature as to take away appetite for dinner.

Gesell and Ilg[3] state that there is usually a steady rise in appetite from 5 years on: "By 9 years nearly all children have a vigorous and generous appetite." *However, they call attention to the fact* that it is not wise to expect uniform levels of appetite throughout the day "Breakfast is the poorest meal, even

crease with increasing age. The authors call attention to the inadvisability of overstressing the development of good table manners, which often are of so much concern to mothers at this period· "From a developmental standpoint graceful table manners constitute a minor problem. . . . Under ordinary conditions the 'manners' improve with age (rather than with scoldings)."

Effort should be made during this whole period to establish taste for all good food. Food prejudices should be discouraged, and a taste for raw vegetables in salad form should be encouraged by serving them regularly. In general, meals should be simple, fried foods and rich desserts being served only occasionally Parents will find that if they themselves eat the right foods regularly, there is less likelihood of poor food habits in the children of the family.

Nutritional Requirements

Calories Beal,[4] studying a considerable group of the same children over a period of years, has shown that there is little difference between the caloric intake of boys and girls up to 5 years of age. After this the boys have a consistently higher caloric intake than girls Her findings are shown at the top of this page.

The Basic Seven foods should be the first source of calories. They should be

[3] *Ibid.*

[4] Beal, V. A., Burke, B S., and Stuart, H C.: *Nutrition studies on children living at home,* Am J. Dis. Child 70 214, 1945.

Daily Food Needs of the 6 to 12 Year Old*

Each of the 7 groups which follow should be included in every day's meals.

Group 1

Dark green leafy and deep yellow vegetables
Such as broccoli, kale, green peppers, turnip and other greens, carrots, sweet potatoes, winter squash
Raw, cooked, frozen, canned
1 or more servings daily

Group 2

Citrus fruit, tomatoes, raw cabbage and other high vitamin C foods
Such as oranges, grapefruit, lemons, limes, tomatoes, muskmelons, fresh pineapples, strawberries, raw cabbage, green peppers and turnips (If fruits are hard to get, use more, especially raw, from Groups 1 and 3.)
1 or more servings daily

Group 3

Potatoes and other vegetables and fruit:
Such as potatoes, beets, celery, corn, eggplant, lettuce, mushrooms, rutabagas, summer squash, apples, apricots, peaches, pears, rhubarb, prunes, raisins, dates, figs and other fruits and berries
Raw, cooked, frozen, canned, dried
2 or more servings daily

Group 4

Milk, cheese, ice cream
Milk—whole, skim, evaporated, condensed, dried, buttermilk
3 to 4 cups daily
The following portions contain as much calcium as a cup of milk 1 oz Cheddar cheese, 4 ozs cream cheese, 12 ozs cottage cheese, 2 or 3 large dips of ice cream.

Group 5

Meat, fish, poultry, eggs, dried beans and peas, nuts
1 serving of meat or fish daily, if possible
4 or more eggs a week
2 or more servings a week of nuts, peanut butter or dried peas or beans

Group 6

Bread and cereals, whole grain or enriched and restored—every day

Group 7

Butter or fortified margarine daily
[illegible]
place of them

* Your Child from Six to Twelve, Children's Bureau, Federal Security Agency, 1949

supplemented by additional bread and potatoes and desserts, and occasionally by other sweets, to meet the total caloric needs.

Calories must be supplied in adequate quantity in the diet if growth is to occur. When the caloric intake is below the needed requirement of the child, protein foods will be used for energy instead of for tissue building. Macy and Hunscher[5] have shown that "a difference in intake of as few as ten calories per kilogram of body weight per day (or approximately four calories per pound) may make the difference between progress and failure in satisfactory growth"

[5] Macy, I G, and Hunscher, H A., J. Nutrition 45,189, 1951

Protein. Protein needs increase with growth, and protein intake will increase with increased caloric intake if a variety of foods is eaten A quart of milk a day, from 4 to 7 eggs a week, a serving of [illegible] tained largely from carbohydrates, including candy and soft drinks in excess, both the quantity and the quality of the protein intake will suffer.

Calcium and Iron. A quart of milk daily will provide the necessary calcium as well as good quality protein and some of the essential vitamins. Iron needs are met by an adequate intake of meat,

eggs, green, leafy vegetables, whole-grain and enriched breads and cereals and potatoes Dried peas and beans and molasses will contribute a share of iron if these foods form a staple article of the diet

Vitamins Vitamin needs are more likely to be met when a variety of foods is included in the diet Milk, butter, fortified margarine and green and yellow vegetables and fruits will provide vitamin A The continued use of fish-liver oils is recommended by some physicians for school-age children to ensure good bone and tooth development. Milk fortified with vitamin D will ensure some intake of this vitamin The B complex vitamins will be included if good-quality protein foods, as well as enriched bread and cereals, appear frequently in the diet In our Southern states, where cornmeal rather than wheat flour is commonly used, it is important to obtain enriched cornmeal when this is possible In at least one Southern state, rice must be enriched by law Vitamin C needs are not met as easily as other nutritional requirements, as the food sources are limited in number Citrus fruits and tomatoes are excellent sources, but not available in some communities except during the growing season Potatoes are a good, cheap source of this vitamin, but they are not a staple article of diet in some of our regional and national dietary patterns Cabbage and other leafy vegetables, particularly raw, will contribute some of this vitamin to the diet whenever these foods are served Foods to include daily in the diet of school-age children will be found on page 175

HIGH SCHOOL AGE

It is during adolescence that the second very rapid growth period occurs. This is usually between the ages of 12 and 14 for girls and 14 and 16 for boys, although it may be sooner for early-maturing children and somewhat later for late-maturing children Physical growth occurs in all directions, in length of bones, in muscle mass, in the laying down of body fat in the soft tissues, and in the widening of the shoulders in boys and the broadening of the hips in girls The total period of rapid growth seldom lasts more than 2 or 3 years, when adult build and stature are reached. However, growth in skeletal muscle mass continues, particularly in the boy. A further "lengthening out" may occur in the late adolescent period in both boys and girls

As may be expected, the nutritional needs to be met by this rapid growth process are increased tremendously. Stuart,[6] in an article dealing with physical growth during adolescence, says. "Food requirements are extremely high during pubescence. Fortunately the appetite is usually voracious, so that enough suitable food will be eaten if it is made available However, unsuitable foods will satisfy the appetite, and faulty habits of food selection formed in earlier years will often be carried over into this period and prevent the taking of an adequate diet. The principal need is for a high protein diet, covered by a liberal allowance of calories"

During this period of rapid physical growth, there is a concurrent maturing of the whole personality, with its attendant strains and stresses There is a striving for independence from parental restriction, coupled with an increased need for guidance and reassurance. The adolescent must be given the opportunity to make his own decisions, and parents must be understanding of this urge for independence, yet be willing to help when asked At this time coffee and tea may begin to appear in the diet as an indication of being "grown up." There is no harm in this if the intake is not excessive, and if it is not substituted for milk. The habits of the parents in this, as in many other matters, are often the deciding factor, as the child patterns himself on the adults whom he knows best

[6] Stuart, H C.: Am J Dis Child. 74 495, 1947

Girls are apt to attempt to reduce or to keep thin at this time. Again, there is no great harm in this so long as the essential foods to meet the nutritional needs are included in the diet Unfortunately, often it is milk (*see* middle section of chart on p 179), eggs,

many years, the incidence among young women between 16 and 18 years of age is higher than any other age group Physicians are inclined to attribute this in part to poor food habits and the fad of slenderizing.

All the foods listed under Daily Food Needs of the 6 to 12 Year Old are essen-

calcium requirement, and girls during their period of rapid growth need at least a quart of milk and preferably somewhat more daily. The increased milk intake will provide good-quality protein for growth as well All the other foods listed, eaten in sufficient quantity, will provide for the greatly increased physiologic needs during this period of growth and stabilization.

Besides adequate calcium, protein and calories, girls need an increased iron intake when menses begin. An adequate amount of foods high in iron, such as lean meats, liver, eggs, green, leafy vegetables, enriched breads and cereals and potatoes, should be included in the daily food intake This is a period when the young girl, beginning to look forward to eventual marriage and motherhood, may be taught in school and in

NUTRITION STUDIES OF CHILDREN

Although children's diets have improved over the years with the spread of the knowledge of nutrition and improved economic conditions, we are a long way from reaching the goal of providing a good diet for every child The most common inadequacies occur in the calcium, the vitamin A and the ascorbic acid intake as compared with the desirable amounts recommended by the National Research Council

Influence of Age. In a report on a series of studies,[7] it has been shown that children of elementary school age in general have better diets than teenagers The younger children drink more milk and eat more servings of citrus

relatively better food habits than older children Some of this is shown in the

of the diets of girls was consistently below that of boys in every age group, with 16-year-old girls making the poorest showing

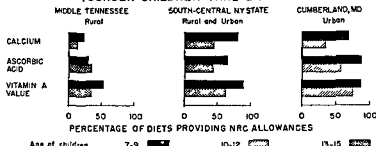
At all ages the nutrients most often low in the diet were calcium and ascorbic acid Even when the dietary intake of calcium by these children was compared on the basis of meeting 67 per cent of the National Research Council

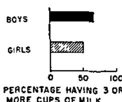
Allowances, a level considered to be minimally adequate, the following data were obtained: Ten per cent of the boys [illegible] to [illegible] this [illegible] 11-year-old groups this figure dropped to 15 per cent for boys and 25 per cent for girls At 12 to 14 years of age, 30 per cent of both boys and girls failed to meet minimal requirements for calcium, and at 15 and over, 21 per cent of the boys and 46 per cent of the girls had diets inadequate in calcium. Since calcium in the diet must be obtained largely from milk, cheese and ice cream, it can be seen that these foods are dangerously low in many teen-agers' diets

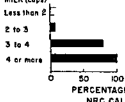
Studies on Vitamin C Intake. That even elementary school children may be markedly deficient in meeting nutritional needs is shown by a nutrition survey of more than 500 children in Louisiana, studied in the winter of 1950

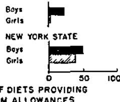


Fig 45. Compare the well-nourished, alert boy on the left with the apathetic, poorly nourished child on the right. Food can make the difference. (Pattison, M., Barbour, H., and Eppright, E: Teaching Nutrition, Iowa State College Press, Ames, Iowa, 1957)









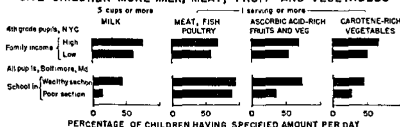


Figure 46

(Nutrition Committee News, July, 1952, Bureau of Human Nutrition and Home Economics, N P.S., U S D.A., Washington 25, D. C)

and in the fall and the winter of 1951.[9] More than half the children were found to have inadequate serum ascorbic acid levels However, there was an age difference even here Of the younger children (7 to 9 years), 61 per cent met the minimum requirements for vitamin C recommended by the National Research Council for this age group, while only 44 per cent of the 10- to 12-year age

[9] Dallyn, M H, and Moschette, D S J Am. Dietet. A 28 718, 1952

group met the recommended minimum. The authors found a significant relation between the serum ascorbic acid levels and the degree of gum changes, that is, the lower the serum ascorbic acid level, the more serious the gum changes. (*See* Chap. 20.)

Income Levels and Culture Patterns. A comparative study of the diets of students in private and in public high schools in *New York City* reported by the Milbank Memorial Fund[10] shows that high-income level and culture are not complete assurances that food intake will be adequate in every respect. The average intake of the private-school pupils generally exceeded recommended allowances of the nutrients protein, iron, calcium, vitamin A and ascorbic acid which were included in the study. Both boys and girls, however, fell below the recommended level of calcium per kilogram, and the girls were short in iron per kilogram. The public-school pupils generally had a lower average of these nutrients, and the total intake was seldom more than equal to recommended standards and sometimes fell below them. Certain cultural differences were noted. In the Jewish group, the diets contained larger amounts of calcium and vitamin C than did those of the group of Italian parentage, while the latter group was higher in vitamin A. That, in general, children of families with higher incomes have better diets than those of low-income families is shown graphically on the bottom section of the chart on page 179.

Causes of Poor Food Intake. The factors that influence poor food intakes of children are those which one would expect. Low-income families and large families with moderate incomes are those in which the children most often have nutritionally inadequate food intakes. Ignorance of the homemaker of what constitutes a good diet frequently leads to poor food habits in the child. Psychological conflicts, not uncommon

[10] Wiehl, D G, and Berry, K Milbank Mem Fund Quart 23 353, 1945.

SIGNS OF OVER-ALL NUTRITURE OF THE CHILD*

A WELL-NOURISHED HAPPILY ADJUSTED CHILD HAS

general appearance of vitality and well-being, eyes clear and bright with no dark circles beneath them, hair smooth and glossy

skeleton well grown and sturdy, strong ...

... ately the skeleton and the muscles and give rounded contour to the body

body functions proceeding normally as evidenced by good appetite and digestion, regular elimination, sound, refreshing sleep, stable nervous system; good endurance, and prompt, adequate recovery from fatigue.

A POORLY NOURISHED CHILD

lacks several or all characteristics of good nutrition, depending on degree or type of malnutrition.

may have strained expression, dark circles beneath eyes, pale mucous membranes of mouth and eyelids

may be hyperactive, without physical endurance, hyperirritable, high strung, or dull, listless and inactive

has subcutaneous fat varying from almost absent to excessive

has lesions of specific nutrient deficiencies that may or may not be evident

* Adapted by Dairy Council Digests, May, 1955, from Martin, E A · Roberts' Nutrition Work with Children, Univ Chicago Press, 1954.

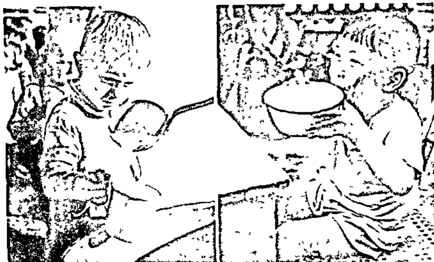


Fig 47 Milk supplied by the United Nations Children's Fund (UNICEF). *(Left)* With tense anticipation, a Greek refugee child watches as his cup is filled with milk. *(Right)* At the feeding center in Barrio Fugoso, Manila, this small boy relishes his daily lunch—a porridge made from rice and milk

in the adolescent, may lead to rejection of food, with resulting underweight, or to overeating, often of nutritionally "empty foods," and consequent overweight, another form of malnutrition. The omission of breakfast, particularly by teen-age girls, is an important factor in the inadequacy of food intake in so many of this group

Characteristics of Well-Nourished and Poorly Nourished Children. The table by Martin on page 180 lists the characteristics of good and faulty nutrition which may be easily recognized by doctors, nurses and teachers It is essential that all those who come in contact with children become aware of the fact that the signs of poor health in children are due often to undernutrition, so that steps may be taken to remove the cause

THE SCHOOL LUNCH PROGRAM

Both parents and teachers long ago recognized the importance of some provision for the school lunch, and in many communities there was some concerted effort toward providing for this in individual schools School lunch programs originated in Europe in the early 1900's, and have since spread throughout the world. In the United States, Federal assistance became available first in 1933 This was followed by distribution through the Department of Agriculture of surplus farm commodities Eventually, the National School Lunch Act, which became effective in 1946, put the school lunch program on a permanent basis The Act is administered by the Department of Agriculture with the co-operation of the State Departments of Education

Organization. The operation of the school lunch plan is in the hands of a local sponsoring agency, which generally consists of school officials Applications for aid may be made by both public and private nonprofit schools The Federal funds are used to reimburse the



Fig 48 A school lunch program in action in Quebec, Canada.
(The Canadian Red Cross Society)

schools for a percentage of the cost of the food purchased. These funds must be matched in amount with funds from state sources. In addition, from time to time, the U. S Department of Agriculture offers the schools supplies of foods, both from its own surplus-removal purchases and from special purchases for the school lunch program.

Type Lunches. Reimbursement to the schools is made according to the

one third to one half of the daily nutri-

beverage.

2. Two ozs. fresh or processed meat, poultry, fish or cheese, 1 egg, ½ cup cooked dry peas or beans, or 4 tbsp of peanut butter.

3 Three-fourths cup of vegetables or fruit, or both

4 One or more portions of bread or muffins or other bread made of whole-grain or enriched flour.

5 Two teaspoons of butter or fortified margarine.

The Type B lunch, used by schools with limited facilities, furnishes only two thirds as much food, and it should be supplemented by food brought from home Where lunchroom facilities are entirely lacking, one half pint of whole milk (known as Type C lunch) may be furnished.

It is estimated that the National School Lunch Program reaches one third of the schoolchildren in the United

States and that three fourths of these children receive the Type A lunch. Allowing for children receiving a school lunch not subsidized by the National School Lunch Program, and for those

gram are both direct and indirect Children receive food which improves their nutritional status and general health, contributing to better performance in school and later as adults at work or in the home. At the same time the school lunch program provides one opportunity for the nutrition education so urgently needed if the incidence of malnutrition is to be reduced.

NUTRITION EDUCATION

of our country. The nurse, either as homemaker or as a worker in public health, may well find herself called upon to contribute to such a program

What can be accomplished in improving the food intakes in children is shown in the report of a program of nutrition education in Ascension Parish, La., carried out from 1944-1948 and re-evaluated in 1950-1951[11] The project included participation by schoolteachers, school lunchroom managers and parents, and was carried on by them after the original investigator left Nutrition was made part of the school curriculum and centered upon the needs, the interests and the age levels of the children It became the core of a school program which was based on community needs, having as its theme "The Improvement of Living Through Community Education" As can be seen by the chart below, marked improvements in food intakes occurred during this program. That these have been maintained by and large is shown by the 1950-1951 evaluation.

[11] Whitehead, F E J. Am Dietet. A 28.622, 1952

STUDY IN NUTRITION EDUCATION IN ASCENSION PARISH, LA.*

Food Group	Percentage of National Research Council Allowances		
	1944–45	1947–48	1950–51
Milk	46	57	60
Eggs	50	76	90
Fruit			
Noncitrus	56	76	78
Citrus	35	60	69
Meat, lean only	109	124	89
Whole grains	29	84	54
Butter, fortified margarine	23	40	58
Potatoes, Irish, sweet	57	91	93
Vegetables			
Green leafy	18	47	45
Other	110	123	126

nu

re-

A similar project[12] conducted from 1952 to 1955 in a group of Kansas City, Mo., schools resulted not only in improvement of children's dietary habits but also in the formulation of recommendations involving all teachers and the entire school curriculum in nutrition education programs.

EVALUATION OF GROWTH AND NUTRITIONAL STATUS

It has been the custom for many years to evaluate a child's progress by comparison with others of his age group. Height and weight tables often have served as the only criteria by which growth has been measured This, however, tells us nothing of the child's growth in relation to his hereditary background, nor of environmental factors [illegible]

but it must be remembered that they tell only part of the story Moreover, a child's growth is better evaluated in terms of his own previous performance.

In judging the total nutritional status of a child we look for many factors Good bone and tooth development, good posture, shining hair, good muscle turgor, clear skin and eyes, plus alertness and curiosity, are all indications of good health and reflect the effect of proper nutrition

Long-term studies now are in progress in such research centers as The Child Research Center in Denver, Colo, The Fels Research Institute for the Study of Human Development at Yellow Springs, Ohio, The Department of Maternal and Child Health at the Harvard School of Public Health in Boston, Mass, and many others, to observe the child's growth and development in relation to his own pattern and to study the interrelationships of all the environmental factors, social, economic, nutritional, psychological, as well as the hereditary factors, on this pattern and rate. In this [illegible]

12 O'Keefe, P. R, and Whitehead, F E · Research in Action The Third Year, Kansas City, Mo, Public Schools, 1955

STUDY QUESTIONS

1. In what ways may environment affect the nutrition of a child?

2. Make out a menu for a day for a rapidly growing 2-year-old child How much milk should be included? In what manner may a child this age prefer to eat some of his food? Should this be permitted? Why?

3. It is important to establish good food habits in the early years of childhood. Outline factors other than the supplying of adequate food that are important. Criticize methods which are sometimes used to entice a child to eat

4. At what age do caloric intake differences [illegible]

5. Which foods should appear daily in the diet of the school child and in what quantities?

6. Make out a menu for 5 box lunches a child can carry to school, each of which will meet approximately a third of his daily requirement.

7. New feeding problems may occur after a child enters elementary school. What are these, and how may they be met?

8. What are the food needs during the rapid growing period in adolescence? Do girls have additional nutritional needs compared with boys? What are these and why do they occur? Which foods should be included daily in the diet of both boys and girls at this age?

9. What evidences have we of malnutrition among schoolchildren? What are some of the causes of such malnutrition? What is being done about them?

13 Symposium, The Child, Vol 16, No 4, December, 1951

10. How can the school nurse make an effective contribution toward the development of a good school lunch program?

11. What do we mean by growth? What is meant by development? Why to give us better methods of evaluation?

12. List the indications of good nutritional status.

See Bibliography in Part Four for other pertinent material on the topics discussed in this chapter.

Adult Nutrition
Our Aging Population
Food Habits of Older People
Food Requirements of Older People—
Calories, Protein, Minerals, Vitamins
Planning Meals for Older People

CHAPTER FIFTEEN

Geriatric Nutrition

Geriatrics is that phase of medicine that deals with the prevention and the treatment of the diseases of old age. Geriatric nutrition is concerned with the conserving of health with advancing years and with the delay of some of the

—better still in childhood

ADULT NUTRITION

The science of nutrition gives major consideration to the food requirements for growth, and with good reason It is during this period that nutritional deficiencies are most likely to show. On the other hand, it is also true that this is the time when results of good nutrition are the most striking. But the time has come for more consideration of adults, both young and old. Webster defines an adult as "a person . who has reached ma-

tain it. Good nutrition is only one of the health practices which help in maintaining strength and vigor, but it is one which can be practiced three times a day and is abused more frequently than any other.

but certainly the surest foundation for a long period of usefulness and activity is that laid in childhood and preserved through youth and adult life The rela-

younger, than their predecessors of a generation earlier This trend in our young people is undoubtedly due to better health practices while they were children. The same factors are also contributing to better health and strength in our adult population, but there is still room for improvement.

The nervous strain under which business executives and professional people frequently work can be tolerated only by a body in prime physical condi-

tion. Men and women in our factories today are protected from industrial hazards, but only recently has the provision of the right food for physical stamina had recognition as an important phase of industrial health work. The nutritional indiscretions and deficiencies during the active period of life may not strike abruptly, but they take their toll in inefficiency, minor ailments, discomforts and increased susceptibility to infections. Premature senility is not inevitable, but it is all too frequent. It is false optimism to expect a body to continue to function normally after years of poor food habits. Men and women past middle life should be able, because of their experience, to make the best contribution to humanity. The lengthening of the active period of life would permit many people to contribute more richly and more extensively to the well-being of families and communities

Sherman was a strong advocate of "the nutritional improvement of life" and ably expressed his ideas on the subject in a series of articles[1] under the title of "Nutrition Engineering." His introductory paragraph is as follows

It has been recognized for centuries that signs of senility might be deferred, but few people were concerned until it was too late. Roger Bacon, the scientific monk of the 13th century, claimed that the three causes of old age were infection, negligence and ignorance. With regard to aging, Bacon said

No one wishes to take thought in regard to methods of prevention, not even physicians, since we see that scarcely one physician in a thousand will give this matter even slight attention. Very rarely does it happen that one pays sufficient heed to the rules of health No one does so in his youth, but sometimes one

perience.

As a method of attack on the problem Bacon suggested "that the wonderful and ineffable utility and splendor of experimental science may appear and the pathway may be opened to the greatest secret of secrets " Experimental science is pointing the way, as Bacon predicted, but human nature has not changed

not do so more often when it is given so little intelligent care The delicate organs and tissues of the body continue to do their respective jobs for many decades if given half a chance No one expects a man-made machine to last as long as that without special care and renewal of parts Nature has a remarkable ability to repair or compensate for worn-out or injured parts if given the opportunity and the right materials As Sherman has put it

It is becoming increasingly clear that, however important the inherited constitution, there is yet a great opportunity open to each of us to provide for such a favorable internal environment as shall

ders service of the greatest social value.

The extra years which the science of nutrition offers, whether these be estimated at seven or ten, more or less, are

[1] Sherman, H. C: Nutrition Engineering, J. Franklin Inst., July, Aug, Oct, Nov, 1944.

Adult Nutrition
Our Aging Population
Food Habits of Older People
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ADULT NUTRITION

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maintain "full strength" if they ever attain it Good nutrition is only one of the health practices which help in maintaining strength and vigor, but it is one which can be practiced three times a day and is abused more frequently than any other.

[illegible]

parent effort or precautionary measures; but certainly the surest foundation for a long period of usefulness and activity is that laid in childhood and preserved through youth and adult life. The relative values of scientific health engineering and heredity are already beginning to show up in the physical and mental development of the present generation. It is a statistical fact that boys and girls who entered college during the decade ending in 1943 were taller, though younger, than their predecessors of a generation earlier. This trend in our young people is undoubtedly due to better health practices while they were children. The same factors are also contributing to better health and strength in our adult population, but there is still room for improvement.

The nervous strain under which business executives and professional people frequently work can be tolerated only by a body in prime [illegible] condi-

Adult nutrition problems deserve and demand consideration even more as our adult population increases Less than half the population was over 20 years of age in 1850, 59 per cent were over 20 in 1920 and about 69 per cent were over 20 in 1950 The nutrition of these 69 per cent of the population is the subject of this chapter.

The life expectancy has increased at an unprecedented rate in the last century. Modern sciences have made it possible for more babies to live to grow up and for more people to live to grow [illegible]

[illegible] 40 years The next 50 years up to 1900 showed an increase of 7 years in life expectancy. During the first half of the 20th century the life expectancy in the United States has increased approximately 20 years, making the present figure close to 67 years

The number of people 65 years and over in the United States was over [illegible]

to exceed the rate of increase for some younger groups The progress in health sciences, which primarily is responsible for this increase, is the control of diseases in younger age groups. Medical science knows less about degenerative and chronic diseases of middle and old age, but progress has been made in recent years in the study and the practice of geriatrics, and nutrition is an important phase of prevention and treatment

FOOD HABITS OF OLDER PEOPLE

The food habits of older people do not always fall in line with their food needs. Many of them develop a craving for sweets and seldom make the necessary compensation in the choice of other foods to provide the essential amount of B complex vitamins to take care of the extra carbohydrate Sometimes the difficulties of marketing and food preparation prompt a simplification of meals with the omission of fresh fruits and vegetables This tendency was disclosed by a survey made of the food habits of families in Baltimore[4] Records were kept of the amount and the frequency of use of certain foods during one week The 943 families in the survey were divided according to the age of the homemaker The ratings of the food habits shown in Figure 50 indicate that by far the largest number of unsatisfactory diets were found in the homes where the homemaker was over 60 years of age When the types of foods omitted were studied, it proved to be the green and the yellow vegetables, fruits and milk that were most often inadequate (Fig 51)

Nutritional indiscretions among adults are not confined to any particular class, although the problems among low-income groups are apt to be greater Too much, too little or the wrong kind of food—each is a problem for special consideration

FOOD REQUIREMENTS OF OLDER PEOPLE

Undoubtedly the greatest factor in the prevention of senility is the adoption of a suitable diet It has been demonstrated repeatedly by animal experiments that the life span of animals may be increased by raising the amounts of protective foods beyond those considered [illegible]

One of the marked changes in old age is decreased metabolism—a lowering of the body fires Metabolism is reduced from 10 to 30 per cent as age advances

[3] Current Population Reports, U S Dept of Commerce, Dec. 18, 1957.

[4] Downes, J, and Baranovsky, A · Milbank Mem Fund Quart 23 161, 1944



Fig 49 Two long-faithful volunteers happy doing a needed job (The New York Hospital)

not to be thought of as added to age. Rather, they are inserted at the prime (in any life that was not begun too soon to get the full benefit of the newer knowledge). In social-economic terms this means a continuation of the current increase in adult expectation, and with a smaller percentage of years of dependency

food habits We cite a few examples. the 80-year-old man who learned to eat salads when a thoughtful housekeeper chopped them to make them easier to eat yet kept them colorful and attrac-

who still liked to try new gadgets and ready-prepared foods to make work easier and yet provide interest and variety in meals for two. "Never too old to learn" is a far truer adage than "You can't teach an old dog new tricks"

None of us is too young to begin thinking about improving the health of later years. People buy annuities and life insurance for the future, why not consider other steps which may give even greater security and comfort?

OUR AGING POPULATION

The aged and the aging should be clearly distinguished. the aged are people, aging is a process According to Stieglitz [2] "Aging is continuous. It

factor of time in living." Thus birth, growth, maturation and senescence are all part of the normal aging process. Aging proceeds more rapidly during the growing years because change is more rapid at that time. In the adult the aging process slows down and the rate of this change may be further retarded and the active period of life may be extended by good health practices

[2] Stieglitz, E J., Geriatric Medicine, Philadelphia, Saunders, 1943.

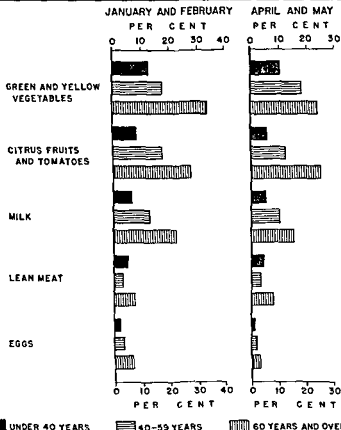


Fig 51. Food habits classified as unsatisfactory for amounts of specific food groups according to age of homemaker (percentage distribution) (Downes, J., and Baranovsky, A.: Milbank Mem. Fund Quart. 23.161, 1944)

More often the appetite prompts middle-aged people to eat more food than they need, and the result is a tend-

day is past when a reduction in the amount of all foods is a satisfactory solution. It is essential to reduce consumption of empty calories—rich desserts, cakes, candies, fats and alcohol.

Reduction in total calories involves the most difficult task of alteration of food habits. Habits of eating play a significant role in nutritional problems.

fixed they become The food habits of

the meals for these persons—the homemaker herself, the nurse or a house-

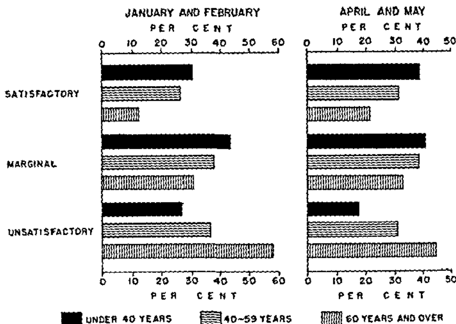


Fig 50. Food habits in relation to age of homemaker (percentage distribution of composite ratings) (Downes, J., and Baranovsky, A.· Milbank Mem. Fund Quart. 22 161, 1944)

At the same time bodily activity is decreased, so that the caloric need is also reduced There is wartime evidence from Europe that the imposed calorie restrictions reduced the incidence of certain degenerative diseases in man In the Netherlands[5] throughout the winter of 1944 to 1945, the average calorie intake for adults was from 1,200 to 1,400, and even lower in the spring. While clinical evidence of starvation was common in urban areas and there was an increase in tuberculosis, ulcer and intestinal diseases, interestingly enough heart disease, hypertension and obesity were greatly diminished. These degenerative diseases associated with obesity are at the top of the list of causes of death or disability among middle-aged and older people in the United States. Insurance companies, from whom the most reliable statistics are available, have long been warning adults more against the habit of overeating than undereating.

[5] Stare, F. J.· Nutrition Rev. 3 225, 1945.

Calorie Needs

The Food and Nutrition Board recommends for each decade between 25 and 45 a reduction of 3 per cent of the requirements at 25 and a reduction of 7.5 per cent for each decade between 45 and 65. After 65, the decline in caloric needs for each decade is about 10 per cent. The food sources of these reduced calories must be chosen with care to include all essential factors and in higher proportion than in former years because of less total food consumed. Sometimes appetite fails to tempt the very elderly to eat enough food or the right kind of food. The undernutrition which may occur can often be relieved by attention to foods with low bulk and concentrated calories, high in protective values and prepared in a way which the person enjoys.

take should always be taken into account.

Mineral Needs

The calcium needs of older people *seem to be appreciably greater than* those of younger adults. Studies made at Michigan State College by Roberts *et al*[8] show that the calcium requirements of their group of older women were higher than figures obtained previously on younger women. Loss of calcium from the bone leads to osteoporosis [illegible] frequently re-

[illegible]

calcium absorption.

More research is needed on why older women seem to fracture bones, especially hips, more often than men Is it that men tend to drink more milk than women, or is there a sex difference in the aging of bones?

At present the best suggestion is to provide liberal amounts of milk and milk products. These may be used in cooking, creamed soups, milk desserts, etc The use of nonfat dry milk *is to be encouraged* in cooking as an inexpensive source of good *protein and calcium Present* evidence favors from 0 8 to 1 0 Gm of calcium per day.

Needs for other minerals are apparently *similar to those for all adults, as* discussed in Chapter 6.

Vitamin Needs

Unfortunately, little *is known* regarding the vitamin requirements of older people and whether *there is a change* with age or associated with chronic disease There is *no evidence, however,* that vitamin requirements are reduced with advancing *years,* and *it is safe to* assume that older people need all the vitamins that they did *in earlier years*

If there has been merely a marginal supply of any of the vitamins *in* the diet for many years, then a reduction in total *food eaten may be sufficient to* precipitate minor nutritional deficiencies. The time factor which is inevitable with advancing age may permit cumulative effects to show up.

The B complex requirement of older people has been the subject of clinical investigation The apparent lift which [illegible] seems to give to some

[illegible]

people inadvertently reduce the B complex intake with reduced calories and fail to make it good from other sources. As a result, slow depletion of body reserves is likely, since these factors are not stored to any extent.

Tuohy[9] presents evidence that thiamine *has a specific action in restoring* muscular activity of the gastro-intestinal *tract through its function in connection* with carbohydrate metabolism This is *in line with Whitney's*[10] *observation of* the beneficial effects of thiamine in *chronic constipation. There is evidence* that other fractions of the B complex *may function also in maintaining normal* muscle tone in the intestinal tract.

Williams[11] *calls* special attention *to* individual variation in the needs for various nutrients, but in none *is* there a greater degree of individuality than in the need for thiamine. *Thus,* what may seem to be inconsistencies in the findings of others regarding human needs for the B vitamins may be the individual differences which should be taken into consideration especially in the elderly. Thus, if a person feels better and responds favorably to extra B vitamins, he probably needed them

The use of vitamin concentrates is not advocated without professional advice. When people buy and take all types of

[8] Roberts, P H, *et al*. J. Am. Dietet. A 24 292, 1948

[9] Tuohy, E L: J.A.M.A. 114 223, 1940

[10] Whitney, E T: Bull. New England M Center 6 170, 1944.

[11] Williams, R. J Biochemical Individuality, New York, Wiley, 1956

keeper—can eliminate some calories behind the scenes while still keeping meals attractive and in the familiar pattern *If people do not see the forbidden foods, one psychological* barrier has been overcome By substituting for rich cakes and pastries such items as puddings and custards made with skim milk, angel food cake and more fruit desserts, gelatins, whips, etc, calories

to use before the food reaches the table The nurse concerned with the continuing education of the patient may need to make specific suggestions along this line in keeping with the socioeconomic status of the patient and his cultural pattern of eating

Surplus calories are not the only reason for curtailing the carbohydrates and the fats in the diets of older people. Some of them seem to have a reduced capacity for metabolizing sugars, and *this may result in* a fluctuating blood sugar level When this is true, less sweets are advisable. Starchy foods in moderation such as potatoes, cereals and bread are better tolerated to meet the caloric needs.

Fats are the most concentrated source of calories and often the invisible components of common foods To be sure, they give flavor and satiety value to

and in turn to the incidence of arteriosclerosis This problem and the sources of fats in the diet are discussed more fully in Chapters 3 and 27.

Protein Needs

Apparently protein needs are not reduced appreciably with age, and yet many older people *eat less protein than* when they were younger. The elderly are more prone to suffer from protein starvation than from any other form of *deficiency. This is most likely to happen* when marketing is difficult, cooking facilities are poor or the money for food is limited. It can also happen among those of better economic status when denture troubles, lack of appetite or too little energy prevents the preparing or the eating of meats or other protein foods

Nitrogen balance studies on elderly men and women show that clinical protein deficiencies are not uncommon. Mild deficiencies may be manifested by a sense of habitual fatigue, slow healing of wounds and lowered resistance. Real protein starvation for an extended period is rare, but it may result in wasting and edema.

Some good-quality protein is essential at each meal regardless of age The Recommended Dietary Allowances suggest no reduction in protein with age, as they do in calories. Some authorities[6] *even suggest more, 1.2 Gm. per Kg.* of body weight, perhaps because it may be used less efficiently. Gillum and Morgan,[7] who have made an extensive study of the nutritional status of older people, find that protein along with iron is needed to maintain the hemoglobin level in their subjects.

Special attention may need to be given to meeting the protein needs of older people This is especially true if he is sharing in the family meals planned to meet the needs of the younger members of the family who need more calories. An extra glass of milk (perhaps reconstituted dry skim milk) at meals or *between meals may be the answer.* If the person lives alone, milk, cheese and eggs are often used as alternates for meat, fish or poultry because of ease in preparation. Adequate calories tend to spare protein, so that the total food in-

[6] Kountz, W. B. J A M A 153:177, 1953
[7] Gillum, H L, Morgan, A F., *et al.*. J. *Nutrition* 55.265, 1955

the young folks at family parties, but they do not want to be conspicuous because of their infirmities With a little preliminary planning of an appropriate menu, the party can be fun for young and old

STUDY QUESTIONS

1 Which well-known scientist was responsible for the concept of "improvability of the norm," and what is meant by that phrase?

2. Surveys have shown that older people are apt to omit certain foods from their diets Which ones are these and which nutrients are deficient as a result?

3 Why is the caloric requirement of older people reduced? How much reduction in caloric intake is recommended for each decade past age 25?

4 If an elderly person shares the family fare but eats less of everything than younger members, which nutrients may be lower than recommended?

5 In what circumstance may the use of vitamin concentrates be justified?

See Bibliography in Part Four for other pertinent material on the topics discussed in this chapter.

vitamin concentrates without scientific advice and regardless either of what ails them or of the natural vitamins present in their daily diets, it takes on the earmarks of a fad Vitamins from the grocer

stituents instead of alone and labeled in units. But when dietary restrictions, common indeed among adults, make it difficult or impossible to obtain enough of certain vitamins in natural foods, vitamin concentrates have a rightful place. One may have confidence in the integrity of concentrates on the market. They are labeled according to the amount of each vitamin present in milligrams, micrograms or International Units per tablet, capsule or measure. The law is strict in holding the manufacturer to these figures on the label.

PLANNING MEALS FOR OLDER PEOPLE

The planning of food to meet the needs of the older age group presents many problems, which are as varied as the circumstances in which such people are living. They may be living alone, or with one or two other older people, and marketing and preparing meals for themselves, they may be the older member in a younger family, they may be cared for by a practical nurse or a housekeeper. Whoever is responsible for planning and preparing food should be aware of likes and dislikes, special needs and limitations There are numerous factors which should be considered, such as ignorance of nutritional facts, food prejudices, fear of new foods, lack of money, limited cooking facilities and poor appetite. The public health nurse

should be a member of the family at mealtime and eat foods prepared for the family. If digestive ability is limited, the family meals should be so planned that the older person may avoid fried foods, rich sauces, pastries and other foods that disagree with him. When lack of meal-

may be welcomed by an older person and may help to induce sleep.

Bulletins and pamphlets published by national and state agencies and by insurance companies give simple information about food for older people. Among these, attention is called to those published by the Institute of Home Economics[12] and by the Community Service Society of New York,[13] which are suitable for the layman, and one by the American Dietetic Association,[14] which is suitable for managers of small homes for the aged in helping to plan and serve meals which are attractive, satisfying and beneficial.

The emphasis in the last-mentioned publication on making simple food attractive and appropriate to the specific needs of an elderly person is appreciated far out of proportion to the effort involved. An example of good planning occurred at the golden wedding of the parents of one of the authors. One parent was a partial invalid and had a denture problem The dinner menu of fruit cocktail, turkey croquettes, mashed potatoes, peas, aspic salad, ice cream

Senior members of most families enjoy

[12] Food Guide for Older Folks, Home and Garden Bull No 17, U.S D A

[13] Food for Health As We Grow Older, Community Service Soc, New York City.

[14] Eating is fun for older people too, Am. Dietet. A., 1952.



Fig 52 This bread offered for sale in Tunisia, North Africa, is in great contrast with our present paper-wrapped loaves of bread Notice the cut pieces that are left unprotected so that the customer may feel them to determine their freshness.

ing or infection From chance alone, a situation which occurs only once in a million meals could cause 517 outbreaks a day in this country. The fact that there are relatively few outbreaks of food poisoning or infection stands as a monument to the integrity and the care of the food industry as a whole.[1]

We are fortunate that, *for the most* part, our food is preserved, stored and marketed efficiently with the aim of minimum waste and loss of nutritive

of preservation

Our industry has advanced to the point where the convenience of the package is one of the greatest sales incentives, because the food that it contains is assumed to be of high quality

[1] Dauer, C C, and Sylvester, G., Pub Health Rep. 72 735, 1957.

and nutritive value packed under strict, sanitary conditions

FOOD-BORNE INFECTIONS

Foods usually are moist and of low acidity, therefore, they are likely to be an excellent media for the survival and

crococcus pyogenes var. *aureus* or *albus*), *Clostridium botulinum*, hemolytic streptococci (*Streptococcus pyogenes*) that cause scarlet fever and septic sore throat, and the diphtheria bacillus (*Cornebacterium diphtheriae*) Foods may also carry the protozoa that cause amebic dysentery and the eggs or larvae of infectious tapeworms and trichina.

These infections may be present in the food at its source, such as animals infected with tuberculosis, brucellosis,

Food-Borne Infections
Food Poisoning
Food Spoilage and Deterioration
Preservation of Foods
Food Additives
Food Laws

CHAPTER SIXTEEN

Food and the Public Health

The dependence of health upon the quality and the quantity of the food supply has been emphasized in the preceding pages. Each step in food production must be controlled carefully to preserve the nutrients, to prevent contamination with harmful micro-organisms and to eliminate toxic chemical residues.

Water and milk and dairy products once were our main concern with regard to outbreaks of disease, but today food products other than these are responsible for the majority of food-poisoning outbreaks In 1951, there were 7 water-borne outbreaks, 12 traced to milk and milk products, and 256 to other foods

Outbreaks of disease traced to milk and water supplies have gone down steadily since pasteurization of milk, tuberculin testing of dairy cattle, chlorination and filtration of municipal water [illegible]

find a report of sickness traced to milk or water supplies. Cholera, typhoid fever and dysentery have almost disappeared, and the rare cases that do occur are traced usually to personal contact or to food handling by carriers of the disease.

In most states, inspection aids in eliminating the infected milk-producing animals—goats (brucellosis) and cows (tuberculosis, brucellosis). Milk now is pasteurized for well over 90 per cent of our population. Safe milk flows from the pasteurizer by a closed system of [illegible]

Foods other than water and milk present a difficult problem of control. They are produced by thousands of processors and handled by millions of people, then may be mishandled by the consumer

The census of 1957 estimates that the population of the United States is about 172 4 million men, women and children. Assuming that these people eat three times a day, there are consumed each day 517.2 million meals amounting to a total consumption of about 1 billion pounds of food each day of the year.

It is not strange that newspapers carry an occasional report of sickness, and even death, caused by food poison-

Fig. 53. Current newspaper releases and stories of some food-borne disease outbreaks. (Dr G. W Molyneux, *Health News*)

requirement is that a sensitive person eat the food, because many people have

sands of cases occur each year, study of the problem is complicated by the lack of a suitable laboratory animal other than human volunteers (who seldom volunteer twice) Kittens have been used to test suspected foods, but their reactions are not completely reliable, and, strange as it may seem, it is difficult to obtain a steady supply of kittens

Control of this type of poisoning is largely that of education If food is refrigerated properly, there will be no opportunity for growth and toxin production by the organisms

Botulism

Botulism is a rare form of food poisoning that occurs in home-canned foods that have been underprocessed and in some meat products such as sausage (Latin word for sausage is botulus) Since *Cl botulinum* is a strict anaerobe, it can grow only under conditions in which air is excluded, such as in a can or deep inside a product.

In recent years canned foods have been remarkably free of poisoning caused by *Cl botulinum* The few reports of occurrences usually indicate improperly processed, home-canned, low acid foods such as corn, beans, beets, asparagus, meat and fish.

The toxin produced is one of the most deadly biologic poisons known. The average mortality is about 68 per cent, and ranges from 50 per cent to 100 per cent in individual outbreaks. Sometimes entire families are killed by botulism

Since this is a dramatic disease in which the person may linger completely conscious a few days before death, much has been made of it for theatrical use,

salmonellosis, tularemia, tapeworms or trichina, and may be carried to the consumer if the food is undercooked (beef or pork). In some cases hen's eggs from an infected chicken may be eaten uncooked in eggnogs and mayonnaise, and in this manner people have contracted salmonellosis.

Food may also be infected by food handlers who are convalescent from infectious diseases. They may be in apparent good health but still carry infectious organisms The organisms may be distributed on food by hands soiled with urine or feces or by spray of oral and nasal secretions by coughing and sneezing over the food being prepared.

Dust falling on uncovered foods and the feces and the bodies of insects may also convey pathogenic organisms to a food supply. To cover cooked foods and to refrigerate properly do much to cut down on the numbers of pathogenic organisms in foods. It is wise to put cooked foods promptly into an efficient refrigerator rather than to allow them to cool thoroughly before refrigerating. Often the period required for cooling in a warm kitchen is sufficient for bacteria to grow rapidly.

Transmission of disease by the eating utensils in a restaurant may be eliminated by scalding all dishes and silverware after washing or by rinsing in clean water containing a residual of at least 100 parts per million of chlorine. Drying should be by drainage, since towels frequently are a means of applying organisms to the utensils rather than of removing them.

The eating of uncooked shellfish may be the cause of typhoid fever if the shellfish were taken from polluted water.

The onset of symptoms of food infection is at least 12 hours after eating and usually 18 to 24 hours, whereas symptoms of food poisoning occur in about 3 hours or less and, to the embarrassment of the caterer, usually at the picnic or the banquet where poisoning occurs.

FOOD POISONING

The term *food poisoning* is used commonly to include all illnesses due to ingestion of food which contains toxins produced by bacteria, poisonous plants and animals, and inorganic and organic chemicals, and even to include allergic reactions.

Bacterial Food Poisoning

The two types of bacteria which produce toxins in food products are quite different in growth habits and also in symptoms of poisoning. One is an aerobic, heat-labile coccus which produces a toxin which is stable to boiling (*M. pyogenes* var. *aureus* or *albus*, previously known as *Staph aureus* and *albus*). The other is a heat-resistant, spore-forming, anaerobic rod which produces a toxin that is destroyed by boiling for 10 minutes (*Cl. botulinum*).

Staphylococcal Food Poisoning

[illegible]

poisoning caused by staphylococci, in which the source of infection is clearly established, a food handler usually is implicated The organisms may gain entrance to the food from nasal or throat secretions of the carrier or from an infected lesion on his hands.

Poisoning is caused by a heat-stable preformed toxin which affects only the gastro-intestinal tract and is characterized by the rapidity (1 to 6 hours) of onset of symptoms (vomiting, diarrhea and abdominal cramps) and rapid recovery

For poisoning to occur there must be infection with a toxin-producing strain of the organism of a suitable food (meats and meat products, custards, filled bakery products and meat or poultry salads) followed by incubation at, or near, room temperature for a cumulative time of over 4 hours. A final

The stale odor of spoiled meat, the foul odor of a spoiled egg and the souring of milk are familiar examples of bacterial spoilage The spoilage of canned foods also is traced usually to bacterial causes

Yeasts and molds are most familiar as causes of spoilage of fresh foods, dried foods and foods of high sugar content. The fermentation of catsup and cider is due to yeast growth The fuzzy growths on bread and cheese and on the surface of jams and jellies indicate mold spoilage The spoilage of citrus fruits and other fruits and vegetables often is due to the growth of molds

Enzymic Food Spoilage

Spoilage due to enzymic action is much more widespread than most people realize Enzymic spoilage appears most often in loss of quality rather than as frank spoilage The haylike flavor of frozen vegetables after long or improper storage is due to enzymic activity. Fruits and vegetables that soften or become overripe during storage may be the result of either enzymic action or mold growth Difficulty has been encountered with some of the newer methods of food preservation, such as processing at extremely high temperatures for a very short time and preservation by irradiation with ionizing rays, since under the conditions used some enzymes are more resistant to destruction than the most resistant spoilage organisms These enzymes can cause off odors and flavors, even though the food is perfectly sterile

Chemical Spoilage

Chemical causes of spoilage include flavor changes due to oxidation, swelling of cans due to production of hydrogen by the action of food acids on the metal of the container, discoloration from the reaction of metal ions from the container with the product to produce discolored crabmeat or corn, and oxidative rancidity of fats

Most of these situations can be prevented by using a lining in the can to protect the can and the contents, such as "fruit" enamel to prevent bleaching of highly colored fruits or "corn" enamel to prevent corn from discoloring Antioxidants are added to foods subject to rancidity to prevent oxidation of unsaturated fatty acids

Physical Causes of Food Spoilage

The spoilage of foods by physical changes usually involves a change of state from a solution to a precipitate, such as is seen in sandy ice cream caused by formation of large lactose crystals during storage at fluctuating temperatures and the formation of glasslike particles in caviar and shrimp caused by struvite crystal formation ($MgNH_4PO_4$)

Exposure to light can cause spoilage in beer bottled in clear glass with an off odor described by the industry as "skunky" beer Sunlight can also cause a tallowy off flavor in milk left too long on the doorstep and at the same time destroy a high percentage of its riboflavin content

The effect of freezing on fresh fruits

crystals in the cells will rupture the cell walls and in so doing will release the enzymes that are the actual cause of the wilting and the discoloration

Spoilage by Animals and Insects

One means by which the Federal Food and Drug Administration can check the sanitary conditions under which a product has been packed is to examine the product for rat hairs and droppings, insects and insect fragments, and mold hyphae. If an excessive quantity of any of these is present, they can confiscate an entire shipment of food and prohibit future shipments until the unsanitary conditions are corrected to the satisfaction of the Food and Drug inspector

Often it would be chemically impossible to show any nutritional difference

but in reality it is quite rare. A doctor seldom, if ever, sees a case of botulism in his career

The toxin is absorbed directly from the stomach and the intestinal tract, and in about 12 to 24 hours it affects the nervous system, causing double vision, difficulty in swallowing, loss of speech and, if fatal, respiratory failure in from 3 to 6 days

An antitoxin has been developed for the 5 known strains of *Cl botulinum*, but it is of little value after advanced symptoms appear.

Natural Food Poisons

Food poisoning is a nonspecific term and may include illnesses due to chemical poisons, poisonous plants or animals and the bacterial toxins mentioned above

It is well known that many varieties of mushrooms are poisonous and have been mistaken for edible types, with disastrous results There is no simple test which will identify edible types other than botanical characteristics

A few plants used as foods are safe at one time and not at another. The young white shoots of pokeweed frequently are eaten with safety as greens in the early spring, but the later green shoots may cause severe illness. The green leaves of rhubarb may contain enough oxalic acid to cause illness, but the succulent leaf stems are eaten without any untoward effects Green parts of white potatoes may contain enough solanin to cause illness, and even death. Clams and mussels on the Pacific coast during the summer may build up a toxin due to an infection with certain plankton

[illegible]

is relatively rare

but causes trouble in Europe occasionally.

Contaminants

There are many chemicals which may accompany food accidentally or otherwise and may be poisonous to man

[illegible]

food from cheap plated cooking utensils

[illegible]

accident A brief list would include copper, mercury, sodium fluoride, insecticides, lead, kerosene, lye, washing soda, detergents and silver polish. Since some 10,000 or more deaths occur each year from the swallowing of poisons, especially by children, it is imperative that containers of poisonous chemicals be marked plainly and kept as far away as possible from food supplies. Many detergent and pesticide manufacturers now add coloring to their product to distinguish it easily from food materials.

Allergic Reactions

Allergic reactions, which are described more thoroughly in Chapter 26, are due to the escape of a specific protein molecule or fragment from the digestive tract into the blood, causing sensitization, so that when that food is

[illegible]

FOOD SPOILAGE AND DETERIORATION

Any change which renders a food undesirable or unfit for human use may be called food spoilage. Although one usually thinks of spoilage as being caused by micro-organisms, it can also be caused by chemical or physical changes or by enzymes. Those companies which have lost thousands of dollars through contamination of their product by rodents and insects would be inclined to agree that insects and rodents are also causes of spoilage.

Microbial Food Spoilage

Microbial food spoilage may be caused by three different groups of micro-organisms. bacteria, yeasts and molds.

The stale odor of spoiled meat, the foul odor of a spoiled egg and the souring of milk are familiar examples of bacterial spoilage The spoilage of canned foods also is traced usually to bacterial causes.

Yeasts and molds are most familiar as causes of spoilage of fresh foods, dried foods and foods of high sugar content. The fermentation of catsup and cider is due to yeast growth The fuzzy growths on bread and cheese and on the surface of jams and jellies indicate mold spoilage The spoilage of citrus fruits and other fruits and vegetables often is due to the growth of molds

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The effect of freezing on fresh fruits

fall Frequently, the formation of ice crystals in the cells will rupture the cell walls and in so doing will release the enzymes that are the actual cause of the wilting and the discoloration.

Spoilage by Animals and Insects

One means by which the Federal Food and Drug Administration can check the sanitary conditions under which a product has been packed is to examine the product for rat hairs and droppings, insects and insect fragments, and mold hyphae If an excessive quantity of any of these is present, they can confiscate an entire shipment of food and prohibit future shipments until the unsanitary conditions are corrected to the satisfaction of the Food and Drug inspector.

Often it would be chemically impossible to show any nutritional difference

between a product heavily contaminated with rat hairs and one free of contamination. However, from an esthetic viewpoint, as well as from the public health aspect, the product free of rat hairs is much to be preferred

PRESERVATION OF FOODS

The methods of food preservation may be divided into two general classes —bactericidal and bacteriostatic. Bactericidal methods are those which destroy the organisms These would in-

salt or sugar).

Refrigeration

Until the discovery of mechanical refrigeration in the last part of the 19th century, the keeping of fresh foods depended upon ice cut in winter and stored in insulated ice houses for use in spring, summer and fall to provide refrigeration. This was particularly unsatisfactory for people in the Deep South

A sudden realization of how much we depend upon the mechanical refrigerator occurs when a storm disrupts the electrical service to homes and grocery stores The problem of keeping milk, meat, fish and vegetables becomes quite acute, for spoilage at room temperature occurs four times more quickly than at 40° F., the temperature of most refrigerators.

Almost all fresh foods now sold have been refrigerated during part of their journey from the producer to the consumer. If high-quality foods are to reach the consumer, the metabolic action of the fruits and the vegetables must be reduced (for these products are made up of living cells), growth of micro-organisms must be inhibited, and chemical and physical changes must be prevented or slowed down

Usually, fresh foods are stored at the lowest temperature possible at which no adverse physiologic changes take place. Bananas, for example, are stored at higher temperatures during ripening (62° to 70° F.), then are held at 56° to 60° F. for storage after ripening. If they are chilled below 56° F. before ripening, they develop a smoky, dull color, and if chilled after ripening the skin turns brown rapidly Apples, on the other hand, usually are stored at 30° to 32° F. for best results.

In order to maintain crispness or an attractive appearance, the humidity usually is maintained as high as possible to prevent loss of moisture, but it must also be low enough not to encourage mold

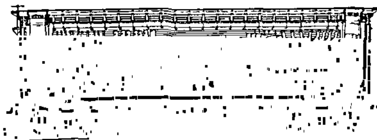


Fig 54 Interior view of a loaded modern refrigerator car. (Swift and Co., Public Relations Department)

relative humidity.

Freezing

There has been a tremendous rise in popularity of frozen foods, due in part to the increased frozen storage and display capacity of stores and the development of frozen storage space in the modern home refrigerator. The major factor has been that frozen foods usually retain more of the qualities and the nutrients of fresh foods than those preserved by any other method

Frozen foods keep because most bacteria will not grow below 32° F., and those enzymes not destroyed by blanching (scalding) are much reduced in activity at 0° F All bacteria are not destroyed by freezing, they are merely unable to grow at such low temperatures When foods are allowed to thaw

tissues

The softening of vegetables after freezing and thawing is due to a partial further softening caused by enzymes released from the normal cycle of metabolism These enzymes (pectic enzymes) attack the pectin which holds the cells together It is for this reason that some fruits and vegetables—i e, tomatoes and lettuce—cannot be frozen satisfactorily.

A fairly recent but very active phase of the food industry is the production of frozen prepared foods It is now possible to have a complete meal from soup to apple pie and ice cream from the freezer and ready to eat in about ½ hour This is particularly valuable for the married woman who is working or is active socially, or for anyone living alone

The home freezer is demonstrating more and more its convenience for food storage and preservation Most housewives, however, will find that it does not save them money, as so many advertisements indicate.

Cooking and Baking

Nearly all the micro-organisms in a food are destroyed by cooking Since this lengthens the time that a food will keep, cooking may be regarded as a

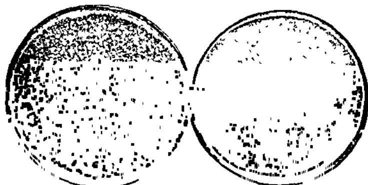


Fig 55 The benefit of pasteurization is illustrated by the difference in these bacterial colonies developing in these two agar plates after incubation for two days at 37° C Each contains 0.1 cc of milk; taken before pasteurization (*left plate*) and from the same milk after pasteurization (*right plate*). (Broadhurst and Given. Microbiology Applied to Nursing, Philadelphia, Lippincott)

method of preservation. In some cases it is a mixed blessing, as a study of food poisoning will quickly show that most cases of food poisoning are caused by consumption of a cooked food which has

the growth of food-poisoning organisms If contamination of the cooked food occurs after cooking from the hands or the nasal spray of a food handler, the toxin-producing organisms then can grow without hindrance.

Pasteurization

The time-temperature relationship of pasteurization is based on the time at a given temperature in which all the organisms which will produce disease are destroyed Milk as it comes from the pasteurizer is not sterile The total bacterial count has been reduced, and all the disease-causing organisms are destroyed.

The reduction in bacterial count plus refrigeration increases the shelf life of many foods other than milk, such as beer, wines, etc. Mild heat treatment of concentrated citrus juices before freezing is practiced by many packers to control the enzymes which may cause clarification and/or gelation of the concentrate if it is mishandled (allowed to remain above freezing) during storage and marketing.

Canning

The first record of preservation by heating a food material is that by Spal-

ervation During the last part of the 18th century, France was, or had been, at war with most of the European countries A constant nutritious food supply for the French army and navy was

1795, the French Government offered a prize of 12,000 francs for a method of preserving food for military use. At this time Nicolas Appert, a confectioner from Paris, began experiments on methods of preserving foods. In 1804 he discovered the art of canning and after 6 years of further research published his method. He collected his reward in 1810 from Napoleon Bonaparte, who was then Emperor of France.

Canning in the United States dates from 1819, and one of the original canneries (started by William Underwood) is still in operation

mined the relationship between microorganisms and food spoilage. He demonstrated that food that had been sterilized by heat would keep indefinitely if recontamination was prevented.

Canning grew steadily from its beginning as a means of preservation and gained added impetus by the use of pressure-processing equipment intro-

could then be accomplished in less than an hour and result in a product of higher quality.

That canning has become a very satisfactory method of preservation is borne out by the fact that 42 billion cans of

of food

This one discovery has probably done more to help mankind maintain an adequate food supply throughout the year than any other.

Canning procedures are improving continually the quality and the retention [illegible]

than a second at temperatures of up to 275° F in a specially designed heat exchanger, cooled immediately and then sealed into sterile containers aseptically This method, known as aseptic canning, is now used on a small scale to process purées and baby foods, but its use is limited because of the high cost of the equipment required and the short packing periods of most canneries.

Dehydration

In the past dehydration was looked upon as one of the least desirable methods of preservation. Technologic advances during and after World War II have made possible much-improved products with special attributes of low cost, reduced weight, convenience and keeping quality.

The use of dehydrated products has increased rapidly in the past 15 years Certain dehydrated products are used by some housewives to the exclusion of their counterparts preserved by other methods An example of this is instant coffee, which now constitutes over 20 per cent of coffee used

Of particular interest to the nutritionist is the availability of instant nonfat dry milk, which brings this excellent food to the consumer at a low price in an easily soluble form with good flavor and keeping qualities

Other items in this multimillion-dollar business are cake, muffin, cornbread, pancake and roll mixes (which are mixtures of dehydrated ingredients), instant potato, orange juice, tomato juice and dessert mixes, precooked dehydrated cereals, rice and tapioca, soups, and dried active yeast. Dried stabilized eggs (whole eggs, egg yolk or egg white) are used widely in bakery products but have not as yet reached wide distribution on a retail scale

Chemicals As Preservatives

[illegible] are used

[illegible]

dium propionate, calcium propionate or sodium diacetate is used in bread to prevent mold growth In general, however, chemical preservatives have had a long hard fight to stay in foods, due to [illegible]

icals, chemical preservatives are not allowed For example, catsup will keep because of the preservative effects of acids, sugars and spices, and for that reason sodium benzoate which for years had been added to catsup may no longer be used.

Antibiotics

The use of antibiotics is a relatively recent advance in food technology. As yet it is allowed by the Food and Drug Administration only in poultry products, and there only oxytetracycline and chlorotetracycline are allowed in such amounts that the residual will be only 7 parts per million[2] At this level practically all the antibiotic is destroyed by cooking

Antibiotics will inhibit the growth of spoilage organisms but do not sterilize food The shelf life of poultry is extended by about 7 to 10 days, but eventually spoilage will occur.

The "acronized process" of the American Cyanamid Company is the use of Aureomycin (chlorotetracycline) in the ice slush in which poultry is cooled after dressing

[2] Stephens, M R · Am J Pub Health 47 341, 1957

method of preservation In some cases it is a mixed blessing, as a study of food poisoning will quickly show that most cases of food poisoning are caused by consumption of a cooked food which has not been properly refrigerated. Cooking destroys the organisms that ordinarily would compete with, and hold in check, the growth of food-poisoning organisms. If contamination of the cooked food occurs after cooking from the hands or the nasal spray of a food handler, the toxin-producing organisms then can grow without hindrance.

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Canning

The first record of preservation by heating a food material is that by Spallanzani in 1765. He sealed food in glass tubes and then boiled them for an hour. His experiment was a success, for he had disproved the theory of spontaneous

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Canning in the United States dates from 1819, and one of the original canneries (started by William Underwood) is still in operation.

mined the relationship between microorganisms and food spoilage. He demonstrated that food that had been sterilized by heat would keep indefinitely if recontamination was prevented

Canning grew steadily from its beginning as a means of preservation and gained added impetus by the use of pressure-processing equipment introduced in 1874 By using steam pressure, much higher temperatures could be reached (5 lbs 227°, 10 lbs. 240°, 15

That canning has become a very satisfactory method of preservation is borne out by the fact that 42 billion cans of food were produced in the United States alone in 1956 This would be enough to supply every man, woman and child in the United States with about 244 cans of food

This one discovery has probably done more to help mankind maintain an adequate food supply throughout the year than any other.

United States has necessitated the use of a long and constantly growing list of chemicals in the production and the preservation of food The technical purposes for which food additives are used would be a study in itself, but they can be outlined briefly with a few examples of each as follows [5]

1 Improving the nutritional quality of a food (vitamin D in milk and oleo, vitamin and mineral enrichment of bread and cereals)

2. Enhancing the keeping quality (antioxidants in fats, antimicrobial agents in fresh poultry, inert gases in packaging, sodium benzoate or sorbic acid in cider)

[illegible]

processing (emulsifiers, stabilizers, acids, alkalis, buffer salts, leavening agents)

Food additives are prohibited specifically by the Food, Drug and Cosmetic Act where they are used to mask faulty processing and handling technics, to deceive the consumer and to aid processing at the expense of a substantial reduction of the nutrition value of the product, and where good manufacturing practices do not require the use of an additive to produce a food item economically

Food additives usually are limited in foods which [illegible]

which would accentuate the cumulative effect of a food additive

FOOD LAWS

Federal Food, Drug and Cosmetic Act

The Federal Food and Drug Administration (FDA) has control over misbranding and adulterating foods shipped interstate or manufactured in a territory of the United States or the District of Columbia. Federal regulations also control imported and exported foods Foods manufactured and sold within a state's boundaries are not subject to Federal regulation but are controlled by the food regulations of the state in which they are produced.

A food is considered to be misbranded if the label is false or misleading, the name and the address of the manufacturer or the distributor are not on the package, the weight or the volume of food contained is wrong or omitted, the label does not comply with regulations or the container is misleading in size or shape

The label must contain the common or usual name of the food and the name of each ingredient other than spices, flavoring and colorings, unless a standard of identity has been established by the FDA [6] The standard of identity places a lower limit on the amount of [illegible]

identity lists the optional ingredients which may be used in the product at the discretion of the manufacturer. If a standard of identity has been established for a food, the list of ingredients does not have to be on the label except for a statement of the presence of artificial flavoring and coloring or chemical preservatives, if added.

Labels which contain dietary claims must also give the percentage of the minimum daily requirement for the vitamins or the minerals mentioned. If no minimum daily requirement has been established, the vitamin or the mineral content is given in grams, milligrams or U S P units (United States Pharmacopœia) per 100 grams of food or per serving Many labels also contain a statement of the sodium content of the food,

[5] Food Protection Committee The Use of Chemical Additives in Food Processing, Nat Res Council, Pub No 386, 1955

[6] Janssen, W F., J Am Dietet. A 28: 609, 1952.

Charles Pfizer and Company have also produced a similar process called "biostat," which is a *Terramycin (oxytetracycline)* ice

Canada allows the use of antibiotics in fish, but in the United States the use of antibiotics in fish and products other than poultry is prohibited until it can be demonstrated that the residual antibiotics in food will not cause sensitization and allergic reactions from the residual in the food Of more importance is the danger that their therapeutic use may be prevented by development of allergic reactions to clinically useful antibiotics If heat-labile antibiotics are used and a tolerance is established for their residue by the Food and Drug Administration, the use of antibiotics in fresh foods will be extended to meat, prepackaged vegetables and other foods to lengthen the useful storage life under refrigeration.[3]

Irradiation

Few methods of food preservation have received as much advance publicity and premature ovation as has irradiation This method of preservation de-

nature to hard x-rays). Micro-organisms are destroyed either by direct hit or by free radicals which are released by the ionizing radiations as they pass through the food

Several problems have caused delay of commercial use of irradiation as a means of food preservation. Unit cost is much higher than conventional methods, and in most cases the product is less acceptable to the consumer than those products processed by conventional methods. An off odor and flavor are common to most products, as well as a loss of the characteristic texture of some fruits and vegetables[4]

The approximate sensitivity of various organisms to ionizing radiations in terms of lethal dose in reps is shown by the table on this page. The rep is a quantity of radiation and is the abbreviation

reps, due to off odor and flavor development, sterilization by irradiation is still an unsolved problem However, there are several applications which should reach the consumer in the near future

potatoes and onions, and irradiation followed by refrigeration. It is probable that successful treatments producing a high-quality product will use a combi-

odor.

Irradiated foods have been fed to animals and human volunteers with no untoward results. Vitamin losses due to mild irradiation are similar to those in canning However, if foods are sterilized by irradiation, high losses of vitamins A, C and E occur.

APPROXIMATE LETHAL DOSE OF IONIZING RADIATION

	Rep
Man	400 to 800
Insect	25,000 to 100,000
Mold	100,000 to 1 million
Bacteria	1 to 4 million
Virus	3 to 5 million
Enzymes	About 20 million

FOOD ADDITIVES

The production of an adequate supply of food for a country as large as the

[3] Cahill, V. R · J. Am. Dietet. A. 33.30, 1957.

[4] Wasserman, R. H . J Am Dietet. A 33.33, 1957.

brucellosis and tuberculosis, and regulations concerning sale of margarine [illegible]

[illegible]

Recent Legislation

Concern about the number and the [illegible]

Harvey Wiley, who was chief chemist of the United States Department of Agriculture from 1883 to 1914. He was very active in agitation for legislation to control the indiscriminate addition of chemical preservatives to food Agitation [illegible]

o

ir

F

some of the loopholes through which some marginal food processors were adding questionable chemicals to foods

In 1950 the House of Representatives appointed a committee, now known as the Delaney Committee, to investigate some shortcomings in controls existing in the 1938 law, whereby processors might add chemicals to food without proving their safety or notifying the Food and Drug Administration Through hearings and research the Committee determined that about 740 chemicals were being added to the food supply for one purpose or another and in some cases without adequate testing to determine toxicity The Committee, however, did not publish levels of use, which, of course, are necessary to determine the hazards involved

A few years later the National Research Council appointed a Food Protection Committee to study the problem further in order to evaluate the benefits to the consumer and the extent of the public health problem involved Their report was thorough and informative It described the functions and the technologic benefits of the chemicals used in processing, the foods in which the chemicals were used and, in many cases, maximum levels of use

From 1955 to 1957 many bills were studied by Congressional committees to amend the 1938 law, and in August, 1958, a compromise Food Additives Bill was passed by Congress. The new Food Additives Bill covers the use of intentional additives, incidental additives and sources of ionizing radiation in foods The main features of the new Food Additives Law are

1 *Petition for Use.* Before a manufacturer may use a new food additive a petition for approval by the Food and Drug Administration must be filed with the details of its chemistry, safety, quantity required, effect of addition, conditions of use, method of manufacture, and a method for determination of residual in food After the petition is filed, the FDA will approve or deny its use within 90 days, with an extension of 90 days if necessary

2 *Protest Procedure* If the FDA denies the use of a food additive and the [illegible]

entire record," renders a decision to accept or to deny the use of the [illegible]

[illegible] by the U S. Court of Appeals, where the final decision is made to accept or to deny the use of the additive.

3. *Safety* It is necessary to establish with reasonable certainty that no harm will result from use of the proposed additive An estimation of the probable consumption and cumulative effect must

expressed in milligrams per 100 grams of food or per normal serving.

A food is considered to be adulterated if it is filthy, putrid or decomposed, if noncertified colors are used, if the container is made of a substance injurious to health (i e , lead), if there is dilution or substitution, or if there is omission of a valuable ingredient. Food is also considered to be adulterated if it contains meat from a diseased animal or one that died by other means than slaughter If a poisonous substance is added to a food when it is not necessary in good manufacturing practices, the food will be considered adulterated

The false advertising of foods, drugs and cosmetics in such quarters as television and radio is not under the jurisdiction of the FDA but is controlled by the Federal Trade Commission

An amendment to the Food, Drug and Cosmetic Act of 1938 was passed in 1954 to establish safe limits of pesticide chemical residues on fresh fruits and vegetables The chemical pesticide sprays range in toxicity to man from virtually harmless to extremely toxic and dangerous poisons. To control their use the FDA has published a list of tolerances for over 1,400 pesticide chemicals and has established a zero tolerance for certain pesticides which are extremely dangerous, such as cyanides, mercury-containing compounds and selenium-containing compounds.

To protect the consumer, foods

imprisoned, depending upon the circumstances

Federal Meat Inspection Act

Through the Bureau of Animal Industry (BAI), the Secretary of Agriculture administers regulations concerning the meat industry This regulation provides for the inspection of all cattle, sheep, swine and goats slaughtered in any state, territory or the District of Columbia for transportation or sale as articles of interstate or foreign commerce. The carcasses and parts of all such animals found to be sound, healthful, wholesome and fit for human food are stamped "Inspected and Passed." Animals found to be unfit for human food are separated and stamped "Inspected and Condemned." Carcasses which have been condemned for food purposes must be destroyed under the supervision of a Federal inspector

The Secretary of Agriculture also has charge of regulations concerning imported and exported meat and meat products, as well as the regulation concerning the labeling of horsemeat Horsemeat may be used for human food, but strict labeling is required to prevent its use as a substitute for beef.

A law passed in 1957 provides for compulsory inspection of poultry and poultry products, and is similar in nature to the Meat Inspection Act.

USDA Grade Standards and Inspection Service for Processed Foods

The Fruit and Vegetable Division of the Agricultural Marketing Service, United States Department of Agriculture, develops grade standards for processed foods and supplies an inspection service for processed fruits, vegetables and related foods

The Federal grading of foods aids in informing processors, sellers, brokers, distributors and buyers concerning the class, the quality and the condition of the product. The grades serve as a basis

State Regulations

It is the responsibility of the individual states to regulate food production and processing in which the product does not leave the state. The state also controls such things as pasteurization of milk, inspection of cattle and goats for

PART TWO

Diet in Disease

Part Two deals with food as a nutrient and its part as a therapeutic measure in the treatment of disease

be made. Feeding tests with animals must be carried out to determine toxicity for animals and set safety factors for use in foods for human consumption.

4 *Tolerances* Tolerances for an additive will be determined by the FDA, and the level of use in a food may be no more than is necessary for the purpose used.

5. *Additives Already in Use.* Additives that were in use before January 1, 1958, must be proven safe for use within 18 months of enactment of the law, with a possible 12-month extension if required. This means that within 30 months all food additives must be proven safe and acceptable by the FDA before use.

6. *Cancer-Causing Chemicals.* No additive can be used in any concentration if it is capable of causing cancer if eaten. Even though no food additive used at the present time is known to cause cancer when eaten, it is possible

reason.

Safety of food additives is a problem of extreme importance that should be considered over all other phases of the question It is practically impossible to demonstrate absolute proof of safety of an additive for all people in a population which may include a few very sensitive individuals and others in poor physiologic condition, as well as those suffering from a disease of one sort or another.

Usually, judgment of safety is based on the result of experiments on three or more types of animals to determine acute toxicity and chronic toxicity at levels far above those intended for use in foods. The maximum level of consumption of an additive in a day's food must be determined or estimated. The minimum level which will produce deviations from normal in animals is studied carefully to determine what effects in humans may be expected, and an adequate margin of safety must be established to reduce to a minimum any hazard to the health of people of varying ages and physiologic state.

STUDY QUESTIONS

1. Are bacteria killed by freezing?
2. Why is it that dehydrated foods do not spoil?
3. Why is milk pasteurized? How is it pasteurized?
4. What information must appear on the label of canned food?
5. Why are food additives used?
6. What are the purposes of "standards of identity"?
7. Why is the use of sodium benzoate in catsup prohibited?
8. What infections may be food borne?
9. How may food poisoning be prevented?
10. Which foods may be poisonous naturally?
11. Which Federal agencies protect our food supplies and what are their limitations?
12. What are the provisions of the 1958 Food Additives Law?

See Bibliography in Part Four for other pertinent material on the topics discussed in this chapter.

Contemporary Development of Nursing and Dietetics

History seems to indicate that Florence Nightingale was the mother not only of the nursing profession but of dietetics as well Her biographer, Sir Edward Cook, reports that when she went to Scutari at the time of the Crimean War in 1854 she was at once confronted with the food problem Forty-five hundred soldiers were lying on cots in corridors and elsewhere, the sick and the wounded occupying from 3 to 4 miles of space The kitchen for these thousands of men was located at the extreme end of the hospital It took from 3 to 4 hours to serve the ordinary dinner, and there were no facilities for preparing special foods for those who were critically ill It is reported that within 10 days after her arrival not only had she established 2 "extra diet kitchens" but she had fitted up an impromptu kitchen on a staircase, and from these diet kitchens 800 men were supplied daily with such foods as chicken broth, arrowroot gruel and other sickroom specialties. In addition, she organized the laundry Then she went to the battlefront—to the hospital at Balaclava "She was anxious to inspect these hospitals, to increase the efficiency of the female nurse establishments and, in particular, to introduce those washing and cooking arrangements which had been productive of so much benefit at Scutari."

In her own *Notes on Nursing* and *Notes on Hospitals*, she makes many comments that still are pertinent. After discussing the importance of variety and the proper cooking of food, she says

"I have often been surprised by the primitive kitchens of some of our civil hospitals with which little variety of cooking is possible. It [illegible] ing of that which is of more importance than most medicines"

The nursing profession from its beginning and until quite recent times was responsible for the dietary work in hospitals The nurse to whom the special phase of work was assigned was often called a dietist, in fact, this term was used in some branches of government work until recent years A movement was started about 1890 in some of the hospitals in the eastern part of this country to place a woman specially trained in foods and in food preparation in charge of the special diet kitchen—at first to teach their nurses how to prepare foods for the sick A graduate of a cooking school in the East was employed by Johns Hopkins Hospital to instruct its nurses in cooking She was probably the first resident teacher of sickroom cookery A little later, in the spring of 1893, the Presbyterian Hospital in Philadelphia decided to start a diet kitchen in which the nurses would be taught to [illegible]

She was given the title "Superintendent of Diet." Exactly when the word dietitian was first applied to this type of food specialist is not known, but it must have developed within the following 10 years

Threefold Responsibility in Dietary Treatment

In view of the rapid advancement in the science of nutrition and in the administrative phases of feeding large numbers of sick people it is not surprising that specialists in this field of knowledge should have invaded the hospital field Nevertheless, the dietary treatment of the sick is a threefold responsibility that rests upon the medical, the nursing and the dietary departments Only by good teamwork can the best results for the patient be obtained

Although the doctor orders the thera-

CHAPTER SEVENTEEN

The Patient and His Nutritional Problems

PSYCHOLOGICAL FACTORS IN FEEDING PEOPLE

In the ensuing chapters we shall deal with many variations of diet modification These must be followed as accurately and painstakingly as the doctor's orders for medication and treatment However diets are prepared for people

Turning back to Chapter 11, we realize the variety of cultural patterns that one is liable to encounter in patients in the hospital. The orthodox Jewish, the Puerto Rican, the Mexican, the Polish and the Italian patient all have food habits very different from our own Even within our own country food patterns differ widely, so that a patient from the South who finds himself in a Northern hospital will think the way vegetables are cooked insipid and unin-

The therapeutic diet itself may have meaning for the patient not realized by the nurse Everyone rejoices with the patient who progresses from a liquid diet to one containing solid food as concrete evidence that he is getting

which must be of long duration may well convey a real sense of deprivation to the patient and carry overtones of discouragement difficult to resolve

Again, food has a symbolic significance which bears little relation to its nutritive value Babcock[1] says that "it is easier to show discouragement through anorexia than it is to explain

prepared and served, but if the patient does not eat it, nothing has been accomplished

[1] Babcock, C G J Am Dietet. A. 28 222, 1952

peutic diet, and the dietitian translates the order *into specific food, it is the* nurse at the bedside and in the home who deals with the patient as he eats the food. Often it is she who must interpret the diet to the patient and make changes and substitutions as necessary to meet the patient's individual needs from day to day or after he goes home. The nurse should be able not only to fill a dietary prescription accurately but *to observe its effects and report* intelligently on them to the doctor. She must also take account of the psychological factors affecting appetite and digestion, and make every effort to induce a patient to eat essential foods.

To know foods and to use them as a means of maintaining and restoring health, as she knows the uses and the effects of medicines, is the big objective in the nurse's study of dietetics. To know how to make variations from the normal diet in disease conditions, she must know food values so as to be able to keep her patient well nourished while adjusting to restrictions imposed by disease.

which may determine acceptance or rejection of the meal Hot food must be served *hot* and cold food *cold* A pot of *hot* coffee or tea may make the remainder of a restricted diet acceptable It tells the patient, as no words can, that those about him really care about him and are making every effort to make his food as palatable as possible.

NUTRITIONAL STATUS OF PATIENTS

The nutritional status of the patient when he enters the hospital should also be observed Older patients may have lost some of their teeth, making chewing difficult if they are placed on a general house diet A patient may be markedly underweight or overweight and be in need of increased or decreased quantities of food on his tray in so far as is consistent with his diet order With the increased longevity of our times there is a corresponding increase in the number of very old patients who enter our hospitals Some of these are in poor nutritional state because they have lost interest in food or, for economic reasons, have eaten very limited diets for a long time.

On the other side of the picture, often a young adolescent with rheumatic fever will be as perpetually hungry as others of his age group, and his caloric and growth needs must be met as nearly as possible within the limitations of his diet order. An antiobesity diet for a short, older woman, who at home leads a fairly sedentary life, should be considerably lower in calories than the diet for an overweight 6-foot truck driver. A patient will need fewer calories on complete bed rest than when he is being mobilized.

These are all observations which the nurse will make more readily than the dietitian, or even the doctor, because of her more constant contact with the patient When she communicates her findings to the doctor and the dietitian, she is doing her share in giving her patient better total care and in making his hospital stay as constructive as possible

THE EFFECT OF IMMOBILIZATION ON NUTRITION

Many patients undergo a period of immobilization, either as an effect of their disease, as in chronic poliomyelitis, or as treatment, such as prolonged rest in the case of tubercular patients and those in casts In a study done on 4 conscientious objectors during World War II, Deitrick and Whedon[2] found increased nitrogen and calcium losses from the body during immobilization, resulting in progressive muscular weakness It would seem to be important that all patients on prolonged bed rest, even when on routine house diets, have additional protein and calcium foods to offset such losses and prevent or reduce muscle weakness in so far as this is possible.

FEEDING THE LONG-TERM AND THE CHRONICALLY ILL PATIENT

One of the most challenging tasks of the nurse and the dietitian is the maintenance of good nutrition in the patient with long-term illness Often in such patients appetite is lost due to the ravages of disease It will be noted that usually the best meal of the day is breakfast, when the patient is rested As the day progresses and the patient becomes increasingly tired, he tends to eat less. Therefore, it is important to serve the most nutritious meals early in the day and a lighter meal in the evening

For the person who eats slowly, the main course should be served on a plate attached to a hot-water container, so as to keep the food warm as long as possible The patient who must be fed may also benefit from such a "hot plate" The feeding of patients, often a slow process and requiring much patience, may be made much more cheerful and homelike by feeding two patients together, allowing one to rest from a

[2] Deitrick, J E., and Whedon, D Am J Med 4 3, 1948



Fig 56 The nurse has excellent opportunities for nutritional observation while doing routine procedures at the bedside (The New York Hospital)

This is also true of the patient confined to bed It is difficult to eat in a semirecumbent position and alone. Most people's lives are set in families, and to eat in bed and by one's self may accentuate the patient's illness in his mind Some hospitals try to meet this

[illegible]

room, may actually be a better setting than that of the private patient in his single room Even a low sodium diet may be accepted when its restrictions are shared with a fellow patient

As can be seen, the nurse must use all her skills in understanding, encouragement and diversion to encourage a patient to eat. There should be a warm appreciation of and a sympathetic approach to food tastes and habits of long standing and of great meaning to the patient The nurse and the dietitian must work in close co-operation, so that the patient's preferences may be met in so far as is possible within the limitations of the diet order and the hospital's facilities With the same patience and ingenuity that would be called for if the patient were meeting some of the other problems of illness, they must work together to help him respond to his diet restrictions

It must not be forgotten that the appearance of the food and the tray also will produce a psychological effect

and which foods will meet these. This applies as a matter of course to diets used in the treatment of disease, where the nurse and the dietitian will work closely together. However, there is also a need for combating the varied misconceptions that people have about food and for teaching sound, basic nutrition to all patients Often the nurse can do this more easily than the dietitian, as she gives the patient bedside care and questions about health practices and food come naturally into the conversation At mealtime, too, the nurse will note what the patient eats or does not eat on his tray, and this gives her another opportunity to emphasize good nutritional usage.

One warning must be given about the choice of words in teaching patients Although the student is familiar with such terms as protein, carbohydrate, metabolism and so on, the patient may have little or no idea of their meaning or of the foods or the processes that these terms represent Even such words as starches and sugars may easily be misinterpreted In a recent survey[4] of 100 patients it was found that a third did not know what the term *nutrition* meant, less than half understood *citrus fruits*, to many the word *vitamins* meant pills, and 25 per cent of the patients did not know which part of the egg was the yolk To encourage the patient to talk of the foods that he knows and enjoys, and to discuss these in terms of their contribution to his nutritional needs, is a more realistic approach It must be kept in mind also that it is better to teach one fact well than to attempt more than the patient can accept or understand As a final check on his comprehension, the patient should be asked to repeat the instruction.

[4] Collins, G E · J Florida M A 42 111, 1955

SUMMARY

These, then, are some of the factors which must be kept in mind when we consider the application of nutrition to

cussed in this chapter should also be kept in mind, so that the diet may be adapted to the individual to meet not only his nutritional but also his emotional and cultural needs

STUDY QUESTIONS

1 Look at the patients under your care at the present time Do any of them present one or more of the problems described in this chapter? If so, has a plan been made with the dietitian for their solution? Have you any suggestions?

2 What psychological factors should be kept in mind in the feeding of patients?

3 What may be expected from the proper nutritional care of the chronically ill patient?

foods which should be included in liberal amounts to meet this specific need

5 How may food be kept warm for the patient who eats slowly?

6 How may the nurse help the pa-

tient understands directions that have been given him?

9 At what time of day does the chronically ill patient have the best appetite?

See Bibliography in Part Four for other pertinent material on the topics discussed in this chapter.



Fig 57 The patient who must be fed is more likely to eat and to enjoy his meal if the person assisting him is cheerful and unhurried. (The New York Hospital)

course of the meal while the other is being fed, and so alternating patients and courses Especially if such patients are capable of conversation, they will eat and enjoy their meal much better than if they were fed alone.

Frequently, chronically and severely ill patients become tired before their meal is finished. A piece of bread, buttered by the nurse and placed in the patient's hand, may encourage him to continue to eat Often these patients are served between-meal nourishments to increase their food intake, yet they have little appetite for them. If the nurse will remember that if the patient takes one swallow or one bite of food he will have had more than he had before, she will be alert to encourage him "to take another bite" each time she passes his bedside

It should be remembered that a return to health or to self-care and reasonable activity may depend as much on the nutritional care of these patients as on other factors Goodman[3] says "The results which can be expected from maintaining or re-establishing a satisfactory nutritional state in older persons and in all individuals with acute and chronic illnesses are gratifying and in many instances actually startling."

TEACHING THE PATIENT

Last, but not least, the nurse has many opportunities for teaching patients something about their nutritional needs

[3] Goodman, J I. Am. J. Nursing 51.165, 1951.

since most of the information has been gained within the last half century

Good food is essential to health This fact is generally accepted, but it is rarely recognized how frequently the poor *selection of food* may be a contributing factor to disease. On the other hand, the intelligent use of food in the treatment of disease has become a matter of special interest to the medical and the nursing professions, as well as to dietitians The wide interest evident in diet fads and diet cures makes it all the more necessary for the professional dietary treatment of disease to be sane and scientifically sound

THE HOSPITAL BASIC DIET

The regular hospital menu should provide a well-balanced diet capable of maintaining a state of good nutrition such as has been discussed in previous chapters It is intended for ambulatory patients and for those whose condition does not require a so-called special or therapeutic diet It is often referred to as the General, the House, the Regular or the Full Diet. It is very similar to a normal family menu and should, of course, be based on the Recommended Dietary Allowances.

The pattern dietary on the next [illegible]

all therapeutic diets, except those used in emergencies or for short periods of [illegible]

supplements.

[illegible]

the specific requirements of the patient will be added For example, cream and sugar will be served with the breakfast cereal, and coffee or other beverages may be served with the 3 meals, either with or without sugar and cream. Jelly with the toast may add pleasure to the meal as well as additional calories Soup and crackers are desirable additions Two more vegetables may be added, one of them raw, if the patient's condition permits If not, additional citrus fruit, such as orange or grapefruit juice, is desirable Desserts also furnish not only calories but other important nutrients as well

The nutritional adequacy of the general, or basic, diet depends not only on the selection of foods but also on the preparation and the cooking, including the time and the temperature of these processes These methods are discussed in detail in Part Three

Typical menus for the regular house diet, built upon the above basic dietary pattern, appear later in the chapter with other standard diets

PROGRESSIVE HOUSE DIETS

Modifications of the normal general diet are made to supply the various needs of the body in disease Modifications may be made chiefly in one or more of the following ways

1 Methods of preparation
2 In consistency
3 In total calories
4 In one or more of the nutrients
5 In specific food

For example, the light, or convalescent, diet differs from the general, or regular, diet chiefly in the method of preparing the food, although consistency, which is due primarily to the cellulose of vegetable foods and to meat fibers, is also a factor.

The soft diet, as indicated by the name, is low in roughage and contains some liquids. The full liquid diet consists entirely of foods in the liquid state.

The Hospital Basic Diet
Progressive House Diets
Dietary Modifications for Specific Conditions
Nutritional Adequacy of Hospital Diets

CHAPTER EIGHTEEN

Diet in the Treatment of Disease

Good diet is a perfect way of curing
And worthy much regard and health assuring
A king that cannot rule him by his diet
Will hardly rule his realm in peace and quiet

The above quotation, taken from an old Latin book on medicine, *Regimen Sanitatas Salernitatum*, and written about A D 1000, expresses an appreciation of diet in the treatment of disease. The ancients wrote the preview, as it were, to dietetics by their acute observations with little but experience to guide them in their judgments Hippocrates, about 400 B C, forecast calorimetry when he wrote "Growing bodies have the most innate heat, they therefore require the most food, for otherwise their bodies waste In old people the heat is feeble and they require little fuel, as it were, to the flame, for it would be extinguished by much"

Artaeus, a Roman physician of about

is just as though the aqueducts were open wide" He further stated his belief that a drug would be found to cure it by controlling thirst It would seem that the discovery of insulin, discussed in the chapter on diabetes mellitus, fulfilled his prophecy

How surprised the sailors of old must have been when, after centuries of fear and dread of scurvy, they were able to return from their long voyages well and happy by the simple use of lemons! This was a forerunner of the discovery of vitamin C, which we now know exists in many fruits and vegetables Byrd's expeditions to the South Pole would have been impossible had not the dietary needs, especially sources of vitamin C, been planned in advance The story of the cure of other deficiency diseases is

A recent article[1] states, "Within modern times irrefutable studies have shown in many parts of the world that diet conditions disease, diet influences growth and development and diet is a decisive factor in determining death rates"

In Part Two will be found an application of the principles of nutrition to the treatment of disease in ways of which the ancients could not have dreamed,

[1] Mann, G V, and Stare, F. J J.A.M A 142 409, 1950

Table of Foods Allowed on Progressive House Diets

Type of Food	General Diet	Light Diet	Soft Diet	Full Liquid Diet
Fruits	All	All cooked and canned fruits, citrus fruits, bananas	Fruit juices, cooked and canned fruits (without seeds, coarse skins or fiber), *bananas*	Fruit juices, strained
Cereals and cereal products	All	Cereals dry or well cooked, spaghetti and macaroni, not highly seasoned	Same as light diet	Gruels, strained
Breads	All	Enriched and whole-wheat bread, soda crackers	Same as light diet	
Soups and broths	All	All	Broth, strained cream soups	Same as soft diet
Meat, fish and poultry	All	Tender steaks and chops, lamb, veal, ground or tender beef, bacon, chicken, sweetbreads, liver, fish	Tender chicken, fish and sweetbreads, ground beef and lamb	
Eggs	Eggs cooked all ways	Soft-cooked eggs	Same as light diet	Eggnogs
Dairy products	Milk, sweet and acid, cream, butter, cheese, all kinds	Milk, sweet and acid, cream, butter; cottage and cream cheese, Cheddar cheese used *in cooking*	Same as light diet	Milk, sweet and acid, cream
Vegetables	All, including salads	Cooked vegetables asparagus, peas, string beans, spinach, carrots, beets, squash Salads tomato and lettuce Potatoes boiled, mashed, *creamed, scalloped,* baked	Cooked vegetables: same as light diet Salads none Potatoes same as light diet	
Desserts	All	Ices, ice cream, junket, cereal puddings, custard, gelatin, simple cakes, plain cookies	Same as light diet	Ices, ice cream, gelatin, junket and custard
Beverages	All	Tea, coffee, cocoa, coffee substitutes, milk and milk beverages, carbonated beverages	Same as light diet	Same as light diet

EVALUATION OF A PATTERN DIETARY FOR ITS NUTRITIVE CONTENT[1]

Food Group	Amt. in Gm	Household Measure	Calories	Protein Gm.	Fat Gm	Carbohydrate Gm	Minerals: Calcium Mg	Minerals: Iron Mg.	Vitamins: A I.U.	Vitamins: Thiamine Mg	Vitamins: Riboflavin Mg	Vitamins: Niacin Mg.	Vitamins: Ascorbic Acid Mg.
Milk or equivalent[2]	488	2 c. (1 pint)	332	17	20	24	576	4	(780)[3]	18	84	.6	6
Egg	54	1 medium	77	6	6		26	1 3	550	.05	14		
Meat, fish or fowl[4]	90	3 ozs , cooked	257	23	18	1[5]	9	2 9	4,815[5]	24	.51	5 7	3[5]
Vegetables,													
Potato, cooked	100	1 medium	83	2		19	11	7	20	.09	.03	1.0	14
Deep green or yellow, cooked[6]	75	½ c.	18	2		4	39	.7	3,300	.06	.09	5	21
Other, cooked[7]	75	½ c	39	2		9	15	.6	190	.07	.06	.7	10
Fruits													
Citrus[8]	100	1 serving	41	1		10	20	3	(95)[3]	06	.02	.2	44
Other[9]	100	1 serving	85	1		22	11	.8	465	.03	04	6	5
Bread, white, enriched	70	3 slices	189	6	2	36	54	1.2		.18	.12	1 5	
Cereal, whole grain or enriched		⅔ c. cooked or 1 oz dry	80	2	1	17	8	.6		05	.03	.7	
Butter or margarine	14	1 tablespoon	100		11		3		460				
Totals			1,301	62	58	142	772	9 5	10,675	1 01	1 88	11 5[11]	103
Compare with recommended allowances[12]													
Moderately active man (70 Kg, 25 yrs. old)			3,200	70			800	10 0	5,000	1 60	1.80	Niacin Equiv. 21	75
Moderately active woman (58 Kg, 25 yrs old)			2,300	58			800	12 0	5,000	1.20	1.50	17	70

[1] Calculations from Table 1, Part Four, Composition of Foods

[2] *Milk equivalents* mean evaporated milk and dried milk in amounts equivalent to fluid milk in nutritive content, cheese, if water-soluble minerals and vitamins have not been lost in whey, and food items made with milk

[3] Parentheses indicate imputed values

[4] Evaluation based on the use of 100 Gm liver, 250 Gm. pork or ham, 150 Gm fish and 500 Gm beef, lamb or veal per 10-day period.

[5] Only if 100 Gm liver is included once in 10 days.

[6] Evaluation based on figures for cooked asparagus, broccoli, carrots and green beans

[7] *Evaluation based on figures for cooked peas, cauliflower, beets, onions* and corn

[8] Evaluation based on figures for whole orange and grapefruit, and orange and grapefruit juices

[9] Evaluation based on figures for banana, apple, unsweetened cooked prunes and sweetened canned peaches

[10] Evaluation based on figures for shredded wheat biscuit and enriched farina

[11] The addition of coffee will add approximately 1 mg. niacin per cup.

[12] From the National Research Council Recommended Dietary Allowances revised 1958

Soft Diet

The soft diet is soft in texture and consists of liquids and semisolid foods It is an intermediate step between the light and the liquid diets. It is indicated in certain postoperative cases, in acute *infections and in some gastro-intestinal* conditions

It is low in residue and is readily digested. Little or no spices or condiments are used in the preparation. It is somewhat more restricted than the light diet in fruit, meat and vegetables. In some hospitals, only puréed vegetables are served, and no meat is allowed

Full Liquid Diet

Foods in the liquid state are more easily digested because they are so finely divided. They are also more easily taken by the acutely ill patient, for whom chewing may be an effort The lightest of foods are given—broths, albumin drinks, thin gruels, fruit juices, lemonade, and tea or coffee if the patient is accustomed to them (For postoperative diets see Chap 32)

The liquid diet may be prescribed in *acute infections and in inflammatory* conditions of the gastro-intestinal tract It is of low nutritive value, and if the condition is prolonged it may be essential to give the largest amount of food possible in the most easily digested form Milk, cream, buttermilk or other sour-milk preparations will add calories and protein Lactose or corn syrup added to beverages will increase the calories High protein feedings may also be included (see Chap. 50). Plain ice cream, fruit ices, junket and plain gelatin desserts are allowed as convalescence proceeds By careful planning the Full Liquid Diet may come close to meeting the normal nutritional needs of the patient, at least minimally It is important that feedings, consisting of at least 6 to 8 ozs , be given every 2 to 3 hours during the day and evening

Application of House Diets

An outline of foods included in the progressive house diets is given in the table on page 223 A comparison of these diets will show how an acutely ill patient may progress from the liquid to the soft, to the light and on to the general, or house, diet Typical menus are also given on the following page

There is some difference in the practice of various hospitals as to what is included in these house diets, and the nurse should familiarize herself thoroughly with the meaning of the terms in the hospital in which she is located

DIETARY MODIFICATIONS FOR SPECIFIC CONDITIONS

In addition to the dietary modifications given in the Standard Hospital Diets, many therapeutic or special diets are necessary in the treatment of disease, as will be shown in the following chapters

The objectives of such dietary treatment may be one or more of the following

1 To adjust the diet to the ability of the body to *metabolize certain food constituents, as in diabetes mellitus*

2 To rest a particular organ, as when fat is reduced in diseases of the gallbladder

3 To increase or decrease body weight by the addition or the restriction of calories

4 To combat long-standing malnutrition, as, for example, the use of the high protein diet in cirrhosis of the liver.

5 To treat or to prevent edema by limiting the use of salt, as in cardiac disease

6. To provide for ease of digestion by exclusion or removal of irritating substances or those which delay the emptying time of the stomach, such as fiber, condiments and fried foods This would apply to diseases of the gastro-intestinal tract

The following outline will show ways

These 3 diets are the simplest in modification and usually are included in Standard Hospital Diets (*see* following paragraphs)

Light, or Convalescent, Diet

A light, or convalescent, diet is intended for convalescent patients not yet able to take the regular diet and for those with minor illnesses. It must be appetizing and readily digested. The chief difference between this diet and the regular house diet is the method of preparation. The foods are cooked plainly—no fried foods or rich pastries are served Other fat-rich foods, such as pork (except bacon) and salad dressings, are avoided. Bran and strong or gas-forming vegetables are avoided, as well as most raw vegetables and fruits All foods included in the soft and the liquid diets may be served in the light diet. In some hospitals this classification is omitted.

TYPICAL MENUS FOR PROGRESSIVE HOUSE DIETS

GENERAL DIET	LIGHT DIET	SOFT DIET	FULL LIQUID DIET
Breakfast			
Fresh pear	Orange	Orange juice	Orange juice, strained
Oatmeal with milk or cream	Oatmeal with milk or cream	Oatmeal with milk or cream	Strained oatmeal gruel with milk or cream
Scrambled eggs	Soft scrambled eggs	Soft scrambled eggs	Coffee with cream and sugar
Buttered whole-wheat toast	Buttered whole-wheat toast	Buttered whole-wheat toast	
Coffee with cream and sugar	Coffee with cream and sugar	Coffee with cream sugar	
			10 A M.
			Eggnog
Dinner			
Vegetable soup	Vegetable soup	Strained vegetable soup	Broth with rice
Roast veal	Roast veal	Ground beef	Ginger ale with ice cream
Mashed potato	Mashed potato	Mashed potato	Coffee with cream and sugar
Buttered broccoli	Buttered carrots	Buttered carrots	
Tomato salad with French dressing	Tomato salad with French dressing	Bread whole wheat or white	
Bread whole wheat, rye or white	Bread whole wheat, rye or white	Butter	
Butter	Butter	Vanilla ice cream with chocolate sauce	
Peppermint stick ice cream	Peppermint stick ice cream	Milk	
Milk	Milk		
			3 P.M.
			Malted milk or buttermilk
Supper			
Cream of pea soup with crackers	Cream of pea soup with crackers	Cream of pea soup with crackers	Strained cream of pea soup
Macaroni au gratin	Macaroni au gratin	Macaroni au gratin	Plain gelatin with whipped cream
Head lettuce salad with Russian dressing	Head lettuce salad with French dressing	Buttered beets	Tea with cream and sugar
Bread	Bread	Bread	
Butter	Butter	Butter	*9 P.M.*
Fruit gelatin	Fruit gelatin	Plain gelatin with whipped cream	Hot cocoa
Tea with cream and sugar	Tea with cream and sugar	Tea with cream and sugar	

NUTRITIONAL ADEQUACY OF HOSPITAL DIETS

In the previous chapter some of the problems which may be encountered in feeding the hospitalized patient were discussed. There is further need for observation of the patient's appetite, particularly in the long-term, chronically ill patient. In a recent study by Goodman and Dowdell,[2] it was found that of 431 chronically ill patients, 138 suffered from undernutrition, and studies by other investigators[3, 4] also warn of the need for constant watchfulness in both chronically and acutely ill patients

The diet as the dietitian serves and writes it may meet all the doctor's specifications and be adequate for the nutritional needs of the patient, but, unless the patient eats and retains it, little has been accomplished Here again the nurse and the dietitian must work hand in hand Not only must the diet be made as acceptable as possible by catering to the patient's likes and dislikes, but, if he still finds it difficult to eat, every effort must be made to meet his nutritional needs in other ways

The very ill patient, or the patient

tient will accept a high protein, high caloric beverage 6 times a day for a few days and then return to a tray with a renewed appetite Even tube feeding may need to be used to maintain the patient's nutritional status, although this should never be done in a punitive fashion Directions for such feedings will be found in Chapters 32 and 50

[2] Goodman, J I, and Dowdell, W. Ann Int. Med 43 1241, 1955

[3] Rhoads, J J Am Dietet. A 29 297, 1953

[4] Duncan, G G · J Am Dietet A. 25· 330, 1949

Keeton[5] has described a method of appetite training for the patient who does not eat a sufficient amount of food to meet his needs Beginning with 1 meal a day, at 10 A M, then increasing it to 2 meals daily, at 10 A.M and 4 P M, he has been able to restore the intake of patients to 3 good meals a day and re-establish caloric and nutritive balance More recently, Fogelman[6] has described the successful use of hypnosis in the restoration of appetite Although such measures may not be feasible in many hospitals, these articles point up the prevalence of the problem and the difficulties that are encountered in meeting it

It is easy to become discouraged with such patients, but the satisfaction of seeing them maintain good nutritional status, and often seeing them recover, is its own reward.

STUDY QUESTIONS

1 What are some of the objectives of therapeutic diets? What patients have you observed whose diets illustrate these objectives?

2. In which ways may diets be modified to meet therapeutic needs? Illustrate with the diets of patients observed by you

3 What is the basic dietary pattern for planning the hospital standard diets?

4 How does each standard hospital

tional foods necessary to supply the required calories Plan a similar menu for a patient on a general, or house, diet, also one on a soft diet Evaluate all 3 menus for nutritional adequacy and attractiveness.

[5] Keeton, R W.: J A M.A. 151 253, 1953

[6] Fogelman, M J, et al.: J. Am Dietet. A. 32 519, 1956

and means of accomplishing these objectives.

1. The total caloric value may be increased or decreased as follows:

A *Increase in energy-producing foods* is needed by patients who are underweight, or whose metabolic rate is above

ness, especially those who have been on fluid diets

B *Decrease in total calories is desirable* when the patient is overweight or when he is acutely ill and food is poorly tolerated

2. Variations in the balance of nutrients may be made to meet a number of conditions

Protein:

A. Liberal allowance is required in tuberculosis and other wasting diseases; in liver and some kidney diseases; in anemia, in wound healing; and during growth, pregnancy and lactation

B A limited amount is sometimes ordered in certain kidney diseases.

Fats:

A. Fats may be increased in the diet when underweight or malnutrition

Carbohydrates:

A. Starches and sugars make up a

are restricted in diabetes mellitus, reduced in obesity.

Purines and purine derivatives are restricted usually in gout.

Minerals:

A. Common salt (sodium chloride) may be increased in Addison's disease and is restricted in cardiac conditions and in diseases of the liver and the kidney, when accompanied by edema.

B. Calcium and phosphorus are increased in rickets, osteomalacia, tetany, dental caries and acute lead poisoning. *They may be decreased in the presence* of kidney stones.

C. Iron is increased in nutritional and hemorrhagic anemias, and in pregnancy.

Vitamins:

Specific vitamins may be increased when the possibility of a deficiency

a deficiency of this vitamin.

Vitamin D—in rickets and osteomalacia.

Vitamin K—in liver or gallbladder disease, where the vitamin may not be absorbed.

Thiamine—in polyneuritis, beriberi, pellagra.

Niacin—in pellagra.

Ascorbic acid—to promote wound healing, in scurvy.

Water Content:

Fluids may be "forced," as in certain types of infections, or they may be restricted when so ordered, as in edema of nephritis or cardiac disease.

Roughage and Bulk:

A. *Little or no fiber should be given* in typhoid fever, in ulceration of any part of the alimentary tract or immediately following operations upon the gastro-intestinal tract.

B. Liberal amount of fiber is prescribed in the treatment of certain types of constipation.

Specific articles of food may have to be omitted when an individual is found to react unfavorably to them This is known as food allergy.

The above outline shows how modifications may be made from the normal diet to meet special needs in the case of disease The reasons for these adaptations will be given in the following chapters.

CHAPTER NINETEEN

Fevers and Infections

Fever is a condition that is characterized by an elevation of body temperature above normal It always is accompanied by an increase in metabolism In most febrile conditions the metabolic rate is increased 7 per cent for each degree Fahrenheit As a result, the carbohydrate stores are quickly exhausted, and body protein and stored fat are used for fuel if insufficient food is eaten There is also a loss of body fluids and salts, especially sodium chloride. In planning the diet for such patients, these factors must be kept in mind.

The advent of the antibiotics has shortened the course of many fevers from weeks to days Typhoid fever is such an infection, and so is pneumococcic pneumonia These now can be classed with fevers of short duration such as colds, grippe and influenza Subacute bacterial endocarditis may run a somewhat longer course, even with antibiotics Recently, the course of rheumatic fever has been much curtailed by the use of the hormones ACTH (adrenocorticotropic hormone) and cortisone A fever which may be of short duration, but in that time extremely destructive of body tissues, is poliomyelitis However, we still have fevers that may last for months, even years, and, therefore, may be classed as chronic Tuberculosis is the outstanding fever of this type

FEVERS OF SHORT DURATION

Metabolic Changes In acute febrile conditions both the energy metabolism and the protein metabolism are increased The longer the fever lasts and the greater the elevation of the temperature, the greater will be the loss of protein from the body tissues This will be excreted chiefly in the urine in the form of nitrogen compounds Body fluids also are lost, as well as the salts or minerals of the blood and the tissues.

Dietary Treatment

Because of the increased metabolism and the destruction of body protein, it will be necessary, sooner or later, to increase both the caloric and the protein intake But since the digestion is also disturbed, and because the fever is of short duration, it is often advisable to [illegible]

6 How would you adapt a general, or house, diet for a chronically ill patient with a poor appetite? (*See* Chap. 17.)

7. Write a menu for a Full Fluid Diet which meets as far as possible the nutritional needs of a patient of aver- [illegible] food intake.

See Bibliography in Part Four for other pertinent material on the topics discussed in this chapter.

because such patients cannot cough. Thin gruels and thinned mashed potatoes sometimes are taken more easily than clear fluids such as tea and broth Because with cell destruction there are also large losses of potassium from the body, orange juice, which is high in potassium, should be included frequently (See the suggested diet below)

Nursing Problems If in the acute phase of the disease the muscles concerned with the swallowing mechanism are involved, it may be necessary to give all nutrients by vein in the form of glucose or fructose, protein hydrolysates and electrolyte solutions As soon as it is possible to pass a plastic tube through the nose into the stomach, tube feedings should be begun. Several types of tube feedings will be found in Chapters 32 and 50. At first the quantities will be small, but they should be increased as rapidly as the patient can tolerate them. When the ability to swallow returns, liquid feedings by mouth may be started.[2]

As soon as the disease subsides, and particularly if there is much tissue damage, an attempt should be made to restore good nutritional status. A high caloric, high protein diet is indicated, and every attempt should be made to get these patients to eat as soon and as much as possible A general or soft house diet (see p 223) plus high caloric, high protein beverages between meals, if eaten, will go far toward this goal (see Chap 50 for recipes).

Fortunately, many poliomyelitis patients recover from the disease with little or no permanent muscle damage These patients will do well on the diet described in the foregoing paragraph and present no further nutritional problems It is the patients with extensive loss of muscle function who, for this reason, are discouraged and may even be resistant to eating, either because it is too much trouble or they have lost [illegible] sible of the patient's own choosing and of such consistency and arrangement that it can be managed without spilling. For instance, fingers may be of more

[2] Seifert, M H J Am Dietet A 30 671, 1954

Liquid Diet for the Acute Stage of Poliomyelitis

Breakfast	Strained orange juice with lactose Hot gruel with sugar and salt Tea with sugar and lemon
10 A M	Strained fruit juice with added protein supplement and lactose
Lunch	Hot broth with added gelatin Strained vegetable juice with added protein supplement Lemon ice
2 P M	As at 10 A.M
4 P M	As at 10 A M.
Supper	Strained clear vegetable soup with added gelatin Tomato juice with added protein supplement Grapefruit juice gelatin
8 P M	Any of the above
10 P M	Any of the above

what to the appetite of the patient, will suffice through the early acute stages of the fever It is important, of course, that

is prescribed, because the food is digested quickly and easily, and is devoid of irritating substances. Another equally important reason is that in this way *the fluid intake is increased.* From 3 to 4 quarts of liquid per day is often prescribed in order to prevent dehydration. Fruit juices, including lemon, orange, pineapple, tomato and grapefruit, are given frequently. Tea and coffee (not too strong) with cream and sugar may be given 2 or 3 times a day. Carbonated beverages may be used to lend variety and to increase fluid consumption.

Broths and strained soups are important for their stimulating effect, and as conveyors of salt (sodium chloride), *which will be used to replace body* losses of this substance as well as fluids.

Milk, of course, is an excellent foundation for a liquid diet. Its importance has been noted in previous chapters The addition of lactose or flavored syrups increases the caloric value and adds variety Gruels, with or without milk, are easily taken. They are warm and bland, and often well tolerated by the very sick patient Feedings should be given every 2 hours During convalescence certain solid foods, such as crisp toast with butter, toasted breakfast cereals (without bran), soft-cooked eggs, baked or mashed potatoes and, later, soft-cooked vegetables may be added. In other words, the liquid diet is followed by a soft diet, later by a light diet, and *still later by a normal*

loss has been considerable, the protein intake should be at least 2 times the normal requirement.

The diet in typhoid fever may differ somewhat from that in other acute fevers in that it should be high in calories and low in residue (*see* Chap 24). Milk and cream, malted beverages and gruel or ginger ale with cream are indicated in frequent feedings if the patient tolerates them. Lactose may be added for extra calories. Fruit juices had best be omitted, as they tend to distend

diet for several weeks.

The diet in rheumatic fever should be the same as that in other fevers. In the acute stage, it should be liquid and as high in calories and protein as feasible If ACTH (adrenocorticotropic hormone) or cortisone is used, the diet may have to be low in salt. Both these hormones tend to increase sodium reabsorption in the kidneys, which in turn causes fluid retention and edema. (*See Part Four, Table 5, for sodium content* of food.) In the chronic stage, the diet may be general or soft and, if carditis is present, low in sodium. (*See* Chap 27 for low sodium diets)

Poliomyelitis. With the introduction of the Salk vaccine, it is to be hoped that the incidence of this dread infection will diminish markedly. However, a number of cases still are being reported, and the need for maintaining good nutritional status in both the acute and the chronic phases of the disease remains important. The diet in the acute *stage is the same as that in* fevers of short duration. Since there may be extremely rapid tissue destruction,[1] protein intake should be at as high a level as it is possible to obtain. In the acute *stage, protein supplements may be* tolerated better than milk and milk beverages, particularly if there is involvement of the trunk and the neck. Milk may increase the production of mucus in the throat, which *is dangerous,*

[1] Bower, A G, *et al* · Am J. M Sc 223 532, 1952

cause of the fever, the caloric needs are increased while for the same reason the appetite decreases The food intake does not keep pace with the need, and weight loss and fatigue result

Dietary Treatment

Although antibiotics and other medications are doing much to control the progress of tuberculosis, they do not effect an immediate cure. Therefore, the diet continues to be highly important in treatment. There has been considerable difference of opinion in the past as to the best type of diet to prescribe Very high protein diets have been recommended, and at other times diets high in fat were favored

Today it is believed that the diet should be moderately high in protein to promote healing and high enough in calories to regain lost weight When the patient has reached his ideal weight, or slightly above, the high protein diet should be continued, but the calories [illegible]

is an ambulatory patient, this should be raised to from 2,800 to 3,000 calories, reduced or modified according to age (*see* Chap 10). It is known that the basal metabolism of the tuberculous patient is increased only moderately, and that destruction of body tissues (protein) is not as marked as in some oth-

rich in minerals and vitamins. Calcium is important for the calcification of the tuberculous nodes. Brewer and her coworkers[3] have shown the need for a greatly increased intake of calcium in a study of tuberculous women if they are to maintain calcium balance Iron is necessary if there has been hemoptysis (hemorrhage from the lungs) Getz[4] found low blood levels of ascorbic acid and vitamin A in patients with tuberculosis Vitamin D is believed to be essential for the absorption and the metabolism of calcium. The B vitamins, having a role in the oxidation of food, should be increased if fever is persistent, they may also stimulate the appetite.

Of the foods especially indicated in tuberculosis, milk stands at the head of the list because of its high content of excellent protein, calcium and vitamins At least a quart a day should be consumed This may be taken in almost any form desired Frequently, the cultured milks, such as acidophilus milk, yoghurt, or even buttermilk, are digested more easily than sweet milk and have at least the advantage of introducing variety into the diet

Eggs, meat, fish, poultry and cheese should be used freely in the diet Fruits and the nongaseous vegetables should be included because of their richness in vitamins and in minerals Fats and carbohydrates in abundance will help to meet the caloric needs The food should be simply prepared and easily digested.

It should always be remembered that the appetite of the tuberculous patient is very likely to be capricious, due to the toxic products of the disease For this reason, constant attention should be paid to the variety and the attractiveness of his diet

The diet for pulmonary tuberculosis should have the following characteristics·

1. Caloric value slightly above normal, or sufficient to maintain weight at normal or slightly above
2. Protein 75-100 Gm
3 Carbohydrate and fat in easily digested form
4 High in minerals and vitamins.
5. Nourishment between meals and before retiring

[3] Brewer, W D, *et al*. J Am Dietet. A. 30 21, 1954

[4] Getz, H R.. J. Am Dietet. A 30 17, 1954

importance than forks in the matter of salads Dishes with hot-water reservoirs beneath them will keep food hot longer than the ordinary dinner plate. All food should be so arranged on the tray that it is easily reached by the patient. If he needs help, it should be given unobtrusively, so as to minimize his need of it. If he must be fed, as with patients in respirators or on rocking beds, the nurse should assume a comfortable position, either sitting or standing, so that the patient will not feel hurried.

If the family lives within visiting distance, they should be encouraged to cook and bring some of the patient's favorite dishes and feed the patient *themselves if this* can be arranged These patients present nutritional problems of long duration It is the patience [illegible] in society.

Complications Patients who are permanently immobilized have a tendency, despite more than adequate diets, to lose nitrogen and calcium from their tissues This may happen even when they spend much of their time on rocking beds. The loss of calcium from the bones may lead to increased urinary excretion of calcium and the formation of calcium phosphate stones in the kidney. For the moderately low calcium, low phosphorus diet used in the treatment and the prevention of such stones, *see* Chap. 28.

CHRONIC FEVERS AND INFECTIONS

The regular afternoon fever, continuing perhaps for a long period of time, is usually the symptom which causes the tuberculous patient to seek medical aid This elevation of temperature may continue for months and even years, thus becoming, indeed, a chronic condition.

Tuberculosis

Etiology and Symptoms. Of the chronic infections, one of the most dreaded is tuberculosis—a malady from which the human race long has suffered Volumes have been written about it, and it still engages the interest of hundreds of specialists in the medical profession. The infection is due to the tubercle bacillus, which may affect any or all tissues of the body, but the lungs are more commonly affected. Pulmonary tuberculosis is characterized by the elevation of temperature already mentioned, by coughing and expectoration, and by loss of weight and strength Be-

A Sample Menu for a Tuberculous Patient

Breakfast	*Dinner*	*Supper*
Citrus fruit Cereal, enriched, with half milk and half cream, sugar Egg and bacon Toast, 2 slices, or muffins Butter or margarine Jam, jelly or marmalade Coffee with sugar and cream	Soup, vegetable or cream Meat or poultry Potato or substitute Vegetable, green or yellow, cooked Vegetable, raw, salad Roll or bread Butter or margarine Glass of milk Dessert, baked apple or other fruit	Tomato or fruit juice Soup, consommé or cream Fish, shellfish or cheese dish Vegetable or fruit salad Bread or roll Butter or margarine Sponge cake with ice cream Tea or coffee with cream and sugar
10 A M	3 P M	9 P M
Malted milk made with milk	Eggnog Crackers or cookies	Hot cocoa with sweet roll or crackers

cause of the fever, the caloric needs are increased while for the same reason the [illegible]

Dietary Treatment

Although antibiotics and other medications are doing much to control the progress of tuberculosis, they do not effect an immediate cure. Therefore, the diet continues to be highly important in treatment There has been considerable difference of opinion in the past as to the best type of diet to prescribe. Very high protein diets have been recommended, and at other times diets high in fat were favored.

Today it is believed that the diet [illegible]

weight. For example, a man weighing 70 Kg but confined to bed should receive from 2,500 to 2,800 calories, if he [illegible]

basal metabolism of the tuberculous patient is increased only moderately, and that destruction of body tissues (protein) is not as marked as in some other fevers Nevertheless, the protein intake should be liberal, averaging from 75 to 100 Gm per day for adults

The diet should include all the foods rich in minerals and vitamins Calcium is important for the calcification of the tuberculous nodes Brewer and her co-workers[3] have shown the need for a greatly increased intake of calcium in a study of tuberculous women if they are to maintain calcium balance Iron is necessary if there has been hemoptysis (hemorrhage from the lungs) Getz[4] found low blood levels of ascorbic acid and vitamin A in patients with tuberculosis Vitamin D is believed to be essential for the absorption and the metabolism of calcium The B vitamins, having a role in the oxidation of food, should be increased if fever is persistent; they may also stimulate the appetite.

Of the foods especially indicated in tuberculosis, milk stands at the head of the list because of its high content of excellent protein, calcium and vitamins At least a quart a day should be consumed. This may be taken in almost any form desired. Frequently, the cultured milks, such as acidophilus milk, yoghurt, or even buttermilk, are digested more easily than sweet milk and have at least the advantage of introducing variety into the diet

Eggs, meat, fish, poultry and cheese should be used freely in the diet Fruits and the nongaseous vegetables should be included because of their richness in vitamins and in minerals Fats and carbohydrates in abundance will help to meet the caloric needs. The food should be simply prepared and easily digested

It should always be remembered that the appetite of the tuberculous patient is very likely to be capricious, due to the toxic products of the disease For this reason, constant attention should be paid to the variety and the attractiveness of his diet.

The diet for pulmonary tuberculosis should have the following characteristics·

1. Caloric value slightly above normal, or sufficient to maintain weight at normal or slightly above
2. Protein 75-100 Gm.
3. Carbohydrate and fat in easily digested form.
4. High in minerals and vitamins
5. Nourishment between meals and before retiring

[3] Brewer, W. D, *et al* J Am. Dietet. A. 30 21, 1954

[4] Getz, H R · J Am Dietet. A 30 17, 1954.

6. It should be on the basis of the light diet while the patient is confined to bed (*see* Chap 18).

Typical Diet. On page 232 is a day's diet for a patient requiring 3,000 calories and approximately 100 Gm. of protein

Drug Complications. It has been found that large doses of *isoniazid*, the antibiotic used commonly in the treatment of tuberculosis, causes rapid excretion of pyridoxine or vitamin B_6 The deficiency results in peripheral neuritis, and possibly anemia. For this reason, pyridoxine may be given along with isoniazid as prevention.[5]

STUDY QUESTIONS

1. A patient has a basal caloric requirement of 1,800 calories and he is running a temperature of 104°. How many more calories will he need because of this temperature? What else will increase his caloric needs?

[5] Biehl, J P, and Vilter, R W.: J.A.M.A. 156.1549, 1954

2. Write a day's liquid diet menu for a patient with an acute fever of short duration.

3. What are the characteristics of the diet used for typhoid fever? Explain the reason for each one.

[illegible]

countered in feeding the poliomyelitis patient?

6. Plan a high protein, semisoft diet for a patient recovering from poliomyelitis who has difficulty feeding himself.

7. How can the moderately low calcium, low phosphorus diet be increased in protein? In calories?

8. What factors should be considered in the feeding of patients with tuberculosis?

[illegible]

10. What additions can be made to the regular diet to increase the calories?

See Bibliography in Part Four for other pertinent material on the topics discussed in this chapter.

CHAPTER TWENTY

Nutritional Deficiencies— Subclinical and Clinical

GENERAL CONCEPT OF DEFICIENCIES

The concept of a nutritional deficiency as a cause of specific disease developed as a result of early work with scurvy and beriberi. It was decades before other forms of ...

trolled lack of specific nutrients in animals and/or man, it became possible to understand the function of these nutrients in metabolism Only with this type of knowledge could subclinical types of malnutrition ...

... dietary insufficiency is limited to a single nutrient If the diet has been so inadequate as to produce obvious disease symptoms, further investigation usually will disclose other symptoms characteristic of multiple deficiencies

It is customary to classify deficiency states as primary and secondary primary when due to an inadequate intake of essential nutrients, secondary, or conditioned, malnutrition when due to poor or incomplete absorption or utilization of nutrients In addition to the specific deficiency diseases such as rickets, beriberi and scurvy, which have long been recognized, research in medical sciences is discovering either primary or secondary involvement of nutrition in many diseases Some conditions not classified as nutritional may be aggravated or even initiated by malnutrition. For instance, war and postwar findings showed an increase in intestinal diseases, ulcers and anemia associated with undernutrition in Holland in the winter of 1944 to 1945.[1]

[1] Stare, F. J : Nutrition Rev. 3 225, 1945

Real deficiency diseases are still encountered in some countries where food supplies are inadequate in quality and quantity. In the United States and many other countries where food supplies are reasonably adequate, only mild or subclinical malnutrition is encountered. Thus, in this chapter the subclinical deficiencies are given special consideration along with comments on the more severe conditions where they are significant for an understanding of the subclinical or where they still present a world nutrition problem.

Underweight and general malnutri- due to insufficient amounts of food

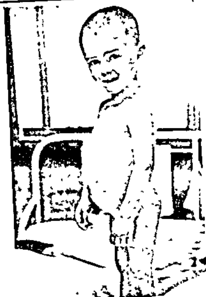


Fig. 58. Malnutrition in a child showing emaciation, protruding abdomen and typical facial expression. (Malnutrition and Starvation in Western Netherlands, 1944-1945, The Hague, General State Printing Office)

PROTEIN DEFICIENCIES

Hypoproteinemia and Nutritional Edema

Incidence. Subclinical forms of hypoproteinemia may accompany other pathologic conditions and may occur without starvation or accompanying edema Actually, hypoproteinemia is a fairly common complication of debilitating disease It may occur following surgery, wounds and severe burns, and it is not an uncommon accompaniment of gastric ulcers and liver and kidney diseases. It may also be a complication of pregnancy

Only recently has science demonstrated the clinical picture of protein deficiency and the several ways in which it may occur.

Etiology. Youmans[2] lists the following conditions as causes of protein deficiency.

1. Deficient intake of protein as related to quantity and to quality (essential amino acids).
2. Failure of absorption or utilization, as in gastro-intestinal diseases
3. Abnormal destruction or loss from the body, as in nephrosis, when large quantities of albumin are excreted by the kidneys, and in severe burns, when the exudate continues for some time.

Youmans also points out the importance of the caloric intake when he says that "of almost greater importance in some cases than the actual amounts of protein is the caloric intake. This is because protein is burned for heat (calories) in the absence of sufficient fat and carbohydrates to supply energy requirements When the amount of protein in the diet is near minimal, the use of some of it for fuel may make the supply inadequate, and amounts which appear adequate may actually be insufficient."

Severe protein starvation with edema is seldom encountered, except during wars or famines, when there are prolonged food shortages. The condition

[2] Youmans, J. B., J.A.M.A. 128 439, 1945.

has been reported in the histories of [illegible]

several smaller communities in North Holland there were as many as 125,000 cases of hunger edema, not including infants.[3]

This report and others from war zones indicated that the occurrence and the severity of the edema were not always related to the degree of protein deficiency, although the two conditions were associated closely.

Well-controlled laboratory observations[4] of men restricted to starvation rations have demonstrated the complex syndrome, resulting from food restriction without the emotional and environmental stresses encountered in war-torn countries The diet and the treatment most advantageous for recovery also were studied under controlled conditions

Symptoms and Pathology. Symptoms of subclinical forms of hypoproteinemia, often without edema, may be loss of weight, strength and appetite, but, since these are characteristic of other diseases, it becomes necessary to

[3] Stare, F J *Op. cit*

[4] Keys, Ancel J Am Dietet A 22 582, 1946



Fig 59. Boys from Kansu Province, China The boy at the left after 4 years spent at Shantan Bailie School, where he was well nourished. The boy at right, a stunted little coal miner of the same age, who has always had an inadequate food intake. (Food & Agriculture Organization of the United Nations)

Real deficiency diseases are still encountered in some countries where food supplies are inadequate in quality and quantity In the United States and many other countries where food supplies are reasonably adequate, only mild or subclinical malnutrition is encountered. Thus, in this chapter the subclinical deficiencies are given special consideration along with comments on the more severe conditions where they are significant for an understanding of the subclinical or where they still present a world nutrition problem.

Underweight and general malnutrition due to insufficient amounts of food or failure to eat because of poor appetite or inability to eat are discussed in Chapter 21 or in other chapters in Part Two.



Fig 58 Malnutrition in a child showing emaciation, protruding abdomen and typical facial expression (Malnutrition and Starvation in Western Netherlands, 1944-1945, The Hague, General State Printing Office)

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[2] Youmans, J B J A M A 128 439, 1945.



Fig. 60. Kwashiorkor. Same child *(left)* with edema and *(right)* showing severe underlying malnutrition when the edema had disappeared following high protein feeding (Instituto de Nutrición de Centro América y Panamá, Guatemala, C. A.)

Pollack[5] found that extreme cases did not respond well to the use of protein hydrolysates, either orally or intravenously. They did make remarkable recoveries on thick eggnog mixtures high in protein made from dried skim milk [illegible]

theoretically should have been beneficial. Blood and plasma transfusions were also given as an emergency source of protein.

Kwashiorkor

One of the most widespread nutritional disorders in tropical and subtropical areas is a syndrome at present ill defined but considered to be a deficiency disease. Brock and Autret[6] visited a large number of territories in Africa under the auspices of FAO, and their report substantiates and expands earlier evidence of the seriousness of this disease. In this report, kwashiorkor is described as composed of 5 essential fea- [illegible]

edema; fatty infiltration, cellular necrosis and fibrosis of the liver; and a heavy mortality when not treated. The term *kwashiorkor*, from an African dialect, has been explained as meaning "red boy," referring to a reddish-hair pigmentation which accompanies the disease in dark-skinned races. Went[7] reported later that the term in another [illegible]

syndrome was first described and named in Africa, it has now been recognized in many parts of the world, particularly in Latin America, South America, Southeast Asia, Indonesia and India. It is

[5] Pollack, H. J. Am. Dietet. A. 23:410, 1947.

[6] Brock and Autret. Kwashiorkor in Africa. FAO Pub., 1950.

[7] Went, L. N.: Doc. Med. geogr. trop. 7. 139, 1955.

resort to laboratory tests for reliable diagnosis The blood may be tested for serum proteins—albumin and globulin—and, if these are below normal, the condition is described as hypoproteinemia. At first no obvious clinical symptoms may be noted, but the serum protein may be low enough to delay wound healing after surgery or recuperation from other diseases.

Urine tests may reveal a seepage of albumin into the urine, which of course is a source of depletion of the body protein, since a loss of 1 Gm. of albumin indicates a loss of 30 Gm. of body tissue. Nausea and vomiting also may result in the loss of protein through decreased intake.

Edema accompanying prolonged starvation has characteristics of clinical significance According to Youmans

> The edema, although not the earliest result of protein deficiency, in our present state of knowledge is about the first clinical sign of the deficiency. One of the characteristics of the edema is its
>
> [illegible]
>
> night.

In the mild form the edema is usually painless and bilateral, and develops gradually. There may be an increase in weight, any loss of body tissue being masked by the edema Weakness, lassitude and mental depression are common, and there is likely to be polyuria, especially nocturia When other disease symptoms are present they are apt to overshadow those due to protein deficiency.

Children deprived of adequate food with protein markedly deficient become emaciated, and growth is definitely retarded. Occasionally, they show some evidence of edema, but it is less marked than in adults. Even after they ha been receiving adequate food lo enough to have regained average weig for height, they may still be unc height for their age. One relief work reported surprise upon learning that little fellow who appeared to be about years old was actually 12, and this ha pened repeatedly. On the other har the facial expression of such children too mature for their age.

Treatment. An adequate diet wi [illegible]

either mild or severe protein deficien The milder type, which may accompa or follow debilitating disease or surge is ignored too often. Frequently the patients have poor appetites or cann eat sufficient food to meet their nee Even though blood or plasma tra fusions have been used to meet the in mediate needs of the critically ill, t continuing requirement of the convale cent for good protein at each meal is utmost importance. This requireme may be recognized but not met wh limited budgets of institutions curt the purchase of adequate protein food

After long periods of protein de ciency or starvation, many months m be required to restore depleted bo tissues to normal. In practice, it m take some time before such persons c tolerate a fully adequate diet, and ce tain precautions are necessary. Perso who have been deprived of food or ha had 1,000 calories or less for extend periods have a decreased capacity f food and must be provided with graduated increase in food of the rig kind. The tolerance for fat is usual low, causing diarrhea or increasing th already present In the rehabilitation c Dutch children in England they we given 1,800 calories the first day, an this was increased to 2,400 only at th end of the first week.

In the treatment of severe emaciatio and protein starvation in Europe

called by various terms, such as multiple-deficiency syndrome, protein malnutrition and, in Spanish-speaking countries, síndrome policarencial infantil[8] The symptoms vary slightly according to reports from these scattered areas, but they are sufficiently similar to lend support to the concept that they are true protein malnutrition Figure 60 from Scrimshaw[9] shows the edema and the emaciation which becomes evident when the edema disappears. Rapid weight gain and recovery follow feeding with milk or some other good protein food.

Recommendations for the prevention of kwashiorkor-type disease in children always emphasize some more adequate source of protein for children when they are weaned from mother's milk. Since it would take many years to provide adequate supplies of animal proteins, in the countries where Kwashiorkor is prevalent, attention is focused upon improving the quality of the protein from vegetable origin Peanuts, soybeans and protein-rich varieties of millet are among the plants giving good yields of protein The improvement of legumes and other foods familiar to these people is recommended instead of introducing new foods which might not be accepted In addition to these general suggestions, more suitable supplementary foods for weaning infants, such as dry skim milk powder, are badly needed Artificial milk from pulses and peanuts, which can be made at home, is also suggested By means of education and aroused interest some progress is being made.

DISORDERS DUE TO VITAMIN A DEFICIENCY

Night Blindness (Nyctalopia) and Glare Blindness (Hemeralopia)

Incidence. Mild deficiencies of vitamin A with a variety of manifestations still occur in the world today One of the early signs long associated with this deficiency is night blindness. In Labrador and Newfoundland, where this condition has been recognized for generations, the popular remedy is fish liver, which the people rarely eat as food but will take as medicine. Varying degrees of night blindness are discovered among children and adults in this country when instruments for detecting and measuring adjustment to dull light are used for routine examinations of large groups In general, it tends to be more prevalent among low-income groups, but some cases are found in almost any group

Glare blindness (hemeralopia), closely related and essentially similar to night blindness, was recognized when automobile drivers complained of being unable to drive at night because of the glare of headlights (Fig 61) During the war pilots were examined especially for this condition, and a liberal intake of vitamin A was recommended as a preventive

Etiology and Pathology. Both nyctalopia and hemeralopia are functional disorders resulting from the slow regeneration of visual purple in the retina of the eye. The difficulty is usually due to insufficient vitamin A to combine with the protein of the retina for the regeneration of visual purple, which is bleached to visual yellow under the influence of bright light Regeneration of visual purple takes place in the dark, but replenishment of vitamin A from the blood stream is necessary to hasten the reaction, i e , to permit adaptation in the shortest possible time

Symptoms and Diagnosis A person may have a mild degree of either night or glare blindness and not be aware of it unless his attention is drawn to it by some circumstance or special test One person may be slower than another in adjusting to the dull light of a movie theater, but neither is aware of a difference Of those who find it difficult to drive at night because of headlight glare, some may have a vitamin A defi-

[8] Report of Third Conference on Nutrition Problems in Latin America, Rome, FAO, June, 1954

[9] Scrimshaw, N S, *et al* J.A.M.A. 164 555, 1957.



Fig 61 (Top) "Glare blindness" often is a symptom of vitamin A deficiency. Headlights dazzle the eyes and cause discomfort. The driver is blinded temporarily by oncoming headlights, and the edge of the road is seen with difficulty (*Bottom*) An adequate intake of vitamin A protects against "glare blindness" or remedies it Properly focused headlights no longer dazzle so blindingly, and the road edge can be seen almost immediately after the headlight glare has passed.





Fig 63 Xerophthalmia, the result of a diet that is deficient in vitamin A. (Marriot, W. McK.: Infant Nutrition, St. Louis, Mosby)

veals some of the pathologic changes, but diagnosis usually is based upon more careful examination with proper instruments. The more severe manifestations of vitamin A deficiency are rare in this country, but xerophthalmia may occur among children in countries where there are food shortages. It occurred during World War I in Denmark when most of the dairy products were being shipped out of the country, skim milk only being retained for home consumption When whole milk was rationed, a pint per day per child, the eye condition was conquered promptly, proving it to have been of nutritional origin. Mild outbreaks have been reported more recently where skim-milk powder provided as a relief food was used with-

eye are decreased as a result of keratinization of the epithelial cells due to a vitamin A deficiency.

Symptoms and Pathology. The first symptoms of xerosis are itching and burning, with a mild light sensitivity, usually accompanied by redness of the lids and some inflammation. There is probably a secondary infection, but this

ally develop hemeralopia before the ophthalmic symptoms appear. The cornea becomes dry and lusterless, and eventually opaque and soft. This infection, once started, may spread rapidly and destroy the eye before the deficiency can be corrected or the infection conquered (Fig 63).

Treatment. An adequate food source of vitamin A is usually sufficient as a preventive. Obviously, a food source of vitamin A would not be sufficient to cure an acute case of xerophthalmia, and massive doses of vitamin A in the form of concentrates probably would be prescribed by the attending physician.

Other Conditions Due to Vitamin A Deficiency

Cutaneous lesions may appear early



Fig. 61 (*Top*) "Glare blindness" often is a symptom of vitamin A deficiency. Headlights dazzle the eyes and cause discomfort The driver is blinded temporarily by oncoming headlights, and the edge of the road is seen with difficulty. (*Bottom*) An adequate intake of vitamin A protects against "glare blindness" or remedies it Properly focused headlights no longer dazzle so blindingly, and the road edge can be seen almost immediately after the headlight glare has passed



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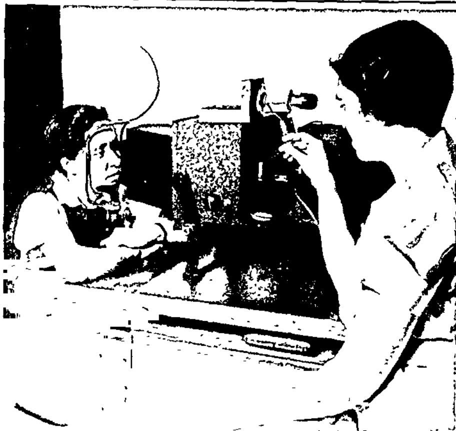


Fig 62. Vitamin A. Testing for nutritional night blindness. (U. S. Institute of Home Economics)

ciency, but there are other possible causes This is not a condition which causes sufficient discomfort to prompt one to seek medical advice unless it reaches an advanced stage. Various types of instruments have been developed to test for light adaptation, but none of them is entirely satisfactory. One form of adaptometer is shown in Figure 62.

Treatment. A daily intake of 5,000 I.U. of vitamin A is more than enough to prevent night blindness or any related condition, unless for some reason the person is unable to use this vitamin or convert carotene into vitamin A. Usually, a food source of this vitamin is [illegible] liver-oil concentrates containing true vitamin A come in the usual 5,000 or 10,000 I.U. to the capsule. For food sources of vitamin A and further discussion of the subject see Chapter 7.

Xerosis and Xerophthalmia

Incidence. Xerosis, an early change in the outer layers of the eye, may be a manifestation of vitamin A deficiency. Gross examination in a good light re-



Fig 63. Xerophthalmia, the result of a diet that is deficient in vitamin A. (Marriot, W. McK.: Infant Nutrition, St. Louis, Mosby)

veals some of the pathologic changes, but diagnosis usually is based upon more careful examination with proper instruments The more severe manifestations of vitamin A deficiency are rare

slipped out of the country, skim milk

Mild outbreaks have been reported more recently where skim-milk powder provided as a relief food was used without supplement for infant feeding.

Xerophthalmia is due to a secondary infection of the cornea which occurs when the protective secretions of the eye are decreased as a result of keratinization of the epithelial cells due to

with a blind light sensitivity, usually accompanied by redness of the lids and some inflammation. There is probably a secondary infection, but this is not as severe as in xerophthalmia.

In children affected with these eye conditions, usually there are numerous other evidences of malnutrition, such as stunted growth and anemia. Adults usually develop hemeralopia before the ophthalmic symptoms appear. The cornea becomes dry and lusterless, and eventually opaque and soft This infection, once started, may spread rapidly and destroy the eye before the deficiency can be corrected or the infection conquered (Fig 63).

Treatment. An adequate food source of vitamin A is usually sufficient as a preventive. Obviously, a food source of vitamin A would not be sufficient to cure an acute case of xerophthalmia, and massive doses of vitamin A in the form of concentrates probably would be prescribed by the attending physician.

Other Conditions Due to Vitamin A Deficiency

Cutaneous lesions may appear early in adults and have a characteristic appearance. Papules tend to form around hair follicles on outer surfaces of arms, legs, shoulders and lower abdomen, and are described as having a "gooseflesh"

appearance They usually disappear when an adequate food source of vitamin A is provided

Respiratory-tract infections are often aggravated by a vitamin A deficiency which allows keratinization of epithelial cells in the respiratory passages, thus reducing their natural resistance to infection Bronchitis, sinusitis, otitis media and pneumonia are all possible consequences of such lowered resistance due to pathologic changes in the mucous membranes The relation of vitamin A deficiency to the common cold is still an open question

Genito-urinary tract changes also may occur as a result of vitamin A defi- [illegible] animals as a result of a vitamin A deficiency and have also been reported in humans in India where diets deficient in vitamin A are common More research is needed to explain complications due to epithelial cell changes resulting from this deficiency.

THIAMINE DEFICIENCY—POLYNEURITIS AND BERIBERI

Incidence. Mild or chronic thiamine deficiency is more often a depletion of the whole group of B complex vitamins. Such a chronic multiple deficiency may be a contributing factor in malnutrition in children and in certain chronic diseases of middle age not ordinarily con- [illegible] Since [illegible] more liberal supply than a lethargic person, and symptoms attributable to lack of thiamine may show up earlier than others.

Genetic differences in metabolism may be responsible for individual variations in requirements for this and other factors.

In this country, polyneuritis resulting from chronic alcoholism is the commonest form of thiamine deficiency encountered, and more often it is a multiple deficiency.

The frank deficiency disease known as beriberi is of special significance among the rice eaters of the Orient, *where it still occurs, but less frequently* than formerly. It has almost disappeared from Japan, where the prophylactic use of thiamine and enriched rice is common today.

Beriberi is described in Chinese history, and some of the earliest attempts to treat it are reported from Japan and the Philippines. The recognition of its cause and that better diet could cure it is one of the landmarks in the history of nutrition. Takaki, a medical officer in the Japanese marines during the 1880's, was alarmed at the number of cases of beriberi—169 on one ship with 25 deaths He proposed a theory that the food must be at fault and helped plan an experiment to prove it. A special [illegible] of beriberi and no deaths on the trip. The 14 men who were sick had refused to eat the meat and the milk. According to the original report, Takaki attributed the improvement to an increase in nitrogen The experiment, reinterpreted in view of modern knowledge, really demonstrated that foods containing more thiamine protected the men against the deficiency disease beri beri.

The extreme condition of human beriberi is seldom encountered in North America, except in certain isolated communities where the food supply is exceedingly limited Such a situation formerly occurred in northern Newfoundland and Labrador, particularly during the winters following poor fishing seasons, when food became scarce and the



Fig 64 (A) Atrophic beriberi (dry). (B) Edematous beriberi (wet) with pigmentation and erosions of the skin (Hoffmann-La Roche, Inc.)

spring as soon as fresh game and fresh fish were available. The men seemed to be more susceptible than the women and the children Thanks to the program of flour enrichment, since 1944 there has been a marked decrease in the incidence of beriberi Now it is seldom seen

Etiology. Beriberi, as such, results only from a long-time deficiency such as may occur among people who eat a

limited diet habitually. When the thiamine intake is insufficient but not extremely deficient over an extended period of time, milder and ill-defined symptoms described below may result.

Symptoms and Pathology. Possible symptoms of a vitamin B_1 deficiency are muscular and nervous fatigue, often vague or ill defined, with or without indigestion and constipation. Cardiovascular manifestations of this deficiency may respond to the administration of thiamine There are other manifestations also, such as anorexia and nausea, which are improved by the same factor.

Symptoms of beriberi are gastro-intestinal disturbances, such as chronic constipation, due to decreased motility, degenerative changes in heart muscle, pain and loss of function, particularly of the lower extremities, due to a multiple neuritis The last condition, which is most disabling, *is often the only* symptom recognized by the native as a part of the disease, therefore, many of the milder cases of beriberi which do not reach the stage of paralysis never are diagnosed as beriberi The two common types of beriberi, known as the wet form and the dry form, are closely related, although they present quite a different appearance to the casual observer (as in Fig 64). Both types show muscle degeneration, loss of motor function and loss of sensation. In the more acute form, fluid may accumulate in certain areas, masking the real emaciation by the edema. In the dry form, which is more chronic, the emaciation is more evident because there is no edema, but the other symptoms are similar. The lack of an adequate food supply is gen-

lent prevent rapid progress in the improvement of food habits.

Treatment. *Adequate food sources* of thiamine are sufficient to prevent any of the deficiency conditions described,



Fig. 65 Bilateral symmetric skin lesions with pigmentation due to niacin deficiency (Youmans, J. B Diagnosis and Treatment of Nutritional Deficiencies, ed. 2, Philadelphia, Lippincott)

but, when the pathologic symptoms appear, more concentrated sources of thiamine usually are necessary for prompt recovery. Anorexia and nausea are often so severe as to preclude an adequate food intake until symptoms have been relieved by the administration of concentrates.

scribe B complex concentrates rather than pure thiamine The dosage for therapeutic purposes is often several times the recommended allowance of 1.0 to 1.6 mg. of thiamine with other

and other fractions of the B complex.)

PELLAGRA AND RELATED DEFICIENCIES

Incidence. Pellagra may occur in

in any part of the country in persons confined to restricted diets. This is more apt to occur when allergy to a number of protein foods limits the diet to a few items Older people and those with self-imposed restrictions also may show pellagra symptoms.

Etiology. Goldberger first demonstrated that pellagra probably was a vitamin deficiency. Earlier, pellagra was thought to be due to a deficiency of protein or to an infection caused by eating spoiled corn Sometimes it was called corn-eaters' disease. Goldberger suggested that there must be a pellagra-

niacin alone Further investigation disclosed that usually there was a multiple deficiency of B complex factors, especially thiamine and riboflavin, as well as niacin, which accounted for certain characteristic symptoms of the disease

and in tryptophan, one of the essential amino acids, which is a precursor of niacin in metabolism Thus, people for whom corn is a major item of diet and who have very little animal protein obtain insufficient amounts of both niacin and its precursor tryptophan

symmetric on the exposed surfaces of arms, legs and neck. They may appear as the earliest manifestation of the disease and look at first like a severe sunburn, later becoming rough and scaly. Since

Gastro-intestinal symptoms are usu-

an anorexia (loss of appetite) or fear of food limits consumption and further ag-

gravates the condition. A lack of hydrochloric acid in the stomach accounts for some of these symptoms and also predisposes the subject to anemia

The neurologic manifestations may [illegible] symptom of deficiency. That, combined with ignorance and poverty, has limited the introduction of adequate preventive measures in many areas. As a consequence, there are still some cases of pellagra scattered through the South that are not receiving either prophylactic or curative treatment

Treatment and Prevention. Severe cases of pellagra now are hospitalized if possible and given multiple-vitamin therapy plus an adequate diet, with the result that they recover in due course. The dosage of niacin and other B complex factors is usually well above the recommended allowance of 17 to 21 mg of niacin equivalent daily and other factors in proportion. Niacinamide is the form in which this factor is administered when large doses are required.

Milk, eggs, meat, nuts and certain vegetables would supply the factors missing in the typical pellagra-producing diet of sorghum molasses, corn grits and fat back. A more varied diet is economically prohibitive among the lower-income groups Nevertheless, educational efforts and other preventive measures among these people have been remarkably effective in reducing the number of cases of pellagra. Sporadic cases will continue to appear where poverty, isolation and ignorance exist. A Negro educator in talking to his people recommended

A garden and a cow, a smoke-house and
 a sow,
Twenty-four chickens and a rooster and
 you'll live better than you uster.

RIBOFLAVIN DEFICIENCY

Incidence. No well-defined deficiency syndrome or disease with a long history, such as scurvy or beriberi, is associated with a lack of riboflavin. However, studies by Spies *et al*[10] show that riboflavin deficiency is one of the common clinical nutrition problems, especially among infants and children in areas where other deficiencies are endemic. As has already been mentioned, this deficiency is often associated with that of [illegible] ore [illegible] a [illegible] responsible for a type of light sensitivity and dimness of vision, followed later by itching, burning and eyestrain. Later clinical manifestations are a shiny red mucosa of the lips with cracking at the corners of the mouth, known as cheilosis, a beefy red tongue and roughened skin around the mouth and the nose, often accompanied by sebaceous exudate.

A riboflavin deficiency in certain animals may interfere with normal fetal development. Until we know more about human need for riboflavin during pregnancy, an adequate supply is certainly recommended. The physiological significance of riboflavin is discussed in more detail in Chapter 8.

Treatment and Prevention. Common food sources of riboflavin are listed in Chapter 8, but it is pertinent to emphasize that this factor is perhaps more difficult than other vitamins to obtain in adequate amounts in low-cost diets Milk and organ meats are the richest natural sources. Enriched bread made with at least 6 per cent of dry-milk solids is also a good economical source Dry yeast, yeast extracts and other B complex concentrates are frequently prescribed by physicians.

ASCORBIC ACID DEFICIENCY—SCURVY

Scurvy is so rare in the United States today that a medical student or a nurse seldom has an opportunity to observe a case. Milder manifestations of this defi-

[10] Spies, T D, *et al*: Am. J. M. Sc. 200. 25, 1940.



Fig 66. Infantile scurvy Typical contractions of extremities from pain (Hoffmann-La Roche, Inc)

ciency do occur, but these are nonspecific in many cases and difficult to recognize as a deficiency syndrome The very scarcity of the frank deficiency in the world today is a tribute to the science of nutrition The history is significant for this reason.

History and Incidence. Scurvy is probably the oldest recognized deficiency disease Although its specific relationship to ascorbic acid was not recognized until the 20th century, its prevention by the use of fresh foods was practiced much earlier. Prevalent in Europe during the 19th century and earlier, for centuries scurvy was attributed to a limited food supply. On the long voyages which followed the discovery of America, sailors often were obliged to subsist for long periods on salt fish and meats, hardtack or other breadstuffs, entirely deprived of any fresh food The outbreaks of scurvy on such voyages were frequently so severe that there was scarcely enough of the crew left to man the vessel In 1772, however, Captain Cook took a voyage which lasted 3 years, during which time not one man was lost because of scurvy. This fact he attributed to the use of a "sweet wort" made from barley and sauerkraut. Subsequently, limes or lemons were included in the supplies, since they had been found to be antiscorbutic, i.e., scurvy preventive

Scurvy probably was responsible for most of the deaths among the pilgrims in the Massachusetts Bay Colony during that first hard winter There was an outbreak of mild scurvy in northern Maine during the depression years, the early 1930's Other outbreaks of the disease have been associated with famine or war areas, when the food supply was limited. Its occurrence in recent years has been limited chiefly to polar expeditions or other circumstances in which fresh-food supplies were unavailable Expert dietetic advice was sought in planning the food supplies for the more recent polar expeditions in order to avoid the possibility of a vitamin C shortage, because scurvy is greatly dreaded by explorers

Eskimos seldom have scurvy on their native diets but are susceptible to it when they adopt the "white man's diet" It is possible that their vitamin C intake may be greater or their requirement less on their native diet.

Symptoms and Pathology. The principal symptoms of scurvy are restlessness, loss of appetite, soreness to the touch, sore mouth and gums with bleeding and loosening of the teeth, petechial

skin hemorrhages, and swelling of the legs with special tenderness about the knee joints. Anemia may occur as a result of the loss of blood.

Well-defined symptoms of this disease are seldom encountered in this country, but sallow skin, muddy complexion, lack of energy, and *fleeting*

infantile scurvy *is* about the only form *encountered, and this is extremely rare.* Irritability, retarded growth and tooth defects may also accompany this dietary deficiency.

Mild manifestations of ascorbic acid *deficiency in adults may easily be over*looked or ignored. Tendency to bruise easily, slow healing of minor wounds and pin-point hemorrhages may be indications of tissue depletion of this factor.

Secondary and vague symptoms of

dietary restrictions of fresh fruits and vegetables. Recovery from surgery is hastened by the attention now given to ascorbic acid in preoperative and postoperative diets. High fever seems to create an increased demand for this factor. Although the reason for this increased requirement is still obscure, liberal supplements of ascorbic acid in concentrated form, in addition to that in the diet, may have significant influence

for all these conditions, but

an adequate supply? There is probably a wide gap between the amount of ascorbic acid necessary to prevent scurvy and the amount essential for optimum health. The recommended allowance of 70 to 75 mg. for normal adults is obviously not enough to saturate depleted tissues or to meet increased demands associated with fevers and infections. It is more than enough to prevent any *symptom of scurvy. Ascorbic acid in* tablet form often is prescribed in daily

use.

Food sources of this factor are entirely adequate for the prevention of scorbutic symptoms or milder manifestations. For rich food sources of ascorbic acid and for a discussion of its properties and losses in cooking, see Chapter 8. Ascorbic acid in tablet form is stable and relatively inexpensive. It is useful when fresh foods are not available or must be omitted from the diet for any

RICKETS

Incidence and Etiology. The number and the severity of the cases of rickets have been reduced greatly in recent

Europe made it one of the deficiency diseases first to attract special attention. The general use today of adequate antirachitic supplements in infant feeding is chiefly responsible for the reduced incidence in northern climates. *It is rare in* our southern states and in tropical countries in general, where children live more out of doors and have more skin

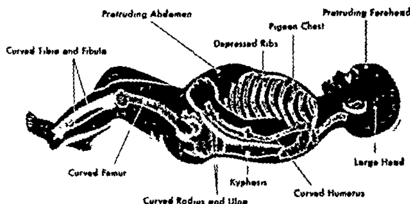


Fig. 67. The symptoms of rickets (Abbott Laboratories)

exposed to the sun. Children of dark-skinned races living in northern climates are even more susceptible to rickets than those of the white race.

The most common form of rickets is due to a vitamin D deficiency sometimes associated with a disturbance in the calcium-phosphorus ratio.

Symptoms and Pathology. Rickets is a disease of infancy and early childhood in which the bones do not calcify properly as they grow. They become pliable, malformed and distorted, the re- [illegible]

[illegible] walk. All these symptoms are pointed out in the schematic drawing of a child with rickets (Fig. 67), and several of [illegible]

than in an emaciated one, but it is characteristic. Profuse sweating and restlessness are early symptoms of rickets in infants. Growth may not be retarded at first, since nature seems to allow the bones to increase in length to keep up with growth in other tissues, but their rigidity is decreased because there has not been a sufficient deposit of calcium salts. Consequently, we may see an infant on a high carbohydrate fattening diet looking plump and well nourished, although a roentgenogram reveals that the bones are not keeping pace with the growth of the body as a whole. When such children begin to walk, they show the characteristic signs of rickets. Prolonged and severe cases usually show stunted growth. Since teeth consist of material similar to bone, a diet or other conditions unfavorable for building bone may lead to malformation of the teeth and predispose to dental caries. Infantile tetany may be associated with a low calcium type of rickets. Tetany is discussed in Chapter 31.

Treatment and Prevention. The major factors involved in the prevention of rickets—calcium, phosphorus and vitamin D—have been discussed in Chapters 6 and 7. Since the geographic incidence of rickets and practical experience indicate that it is more often a deficiency of vitamin D which causes rickets in chil-

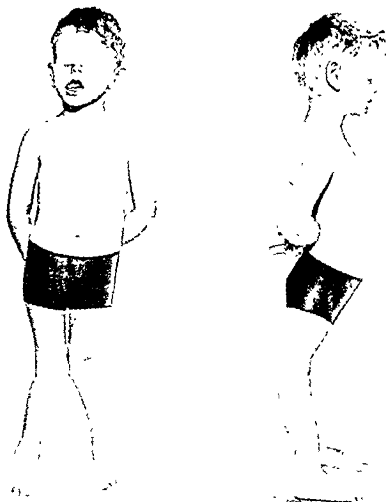


Fig 68 Child suffering from severe rickets. Note knock knees, flat feet, enlarged joints and other skeletal deformities accompanied by very poor posture. (Wisconsin Alumni Research Foundation)

dren, attention is directed to the problem of adequate and reliable sources of this factor in regions where sunshine cannot act as the natural preventive agent Obviously when children can be exposed to an adequate source of ultraviolet light (sunshine or ultraviolet lamp), sufficient vitamin D may be synthesized to regulate the utilization of minerals for bone building. This fact probably explains the low incidence of rickets in Southern states. However, the routine exposure of children to artificial sources of ultraviolet light is neither feasible nor economical. The food sources of vitamin D are so limited as to make it quite impossible to obtain enough antirachitic potency for curative

purposes unless some supplementary source is provided.

Fish-liver oils are now standardized and labeled accurately as to vitamin D potency Cod-liver oil is less concentrated and less expensive than most of the other more potent fish-liver oils, but the cost per unit of vitamin D should be compared when purchasing Viosterol, a solution of vitamin D in oil, may be used upon the doctor's advice when a more concentrated source of vitamin D is desirable, but there is no vitamin A in viosterol as there is in the fish-liver-oil preparations

The present popularity of vitamin D milk as a convenient and a reliable antirachitic agent for infants is well founded. Since milk contains the minerals calcium and phosphorus and it is a natural food for children, it seems to be the most suitable carrier for added vitamin D. Fortified evaporated milk is especially convenient for use in vicinities where fresh vitamin D milk is not available (See Chap. 36)

Precautions. It is wise to caution mothers against the simultaneous use of several [illegible]

[illegible] quart of standard vitamin D milk meets the daily need of the average child

OSTEOMALACIA

Incidence and Pathology. Osteomalacia, sometimes called adult rickets, is characterized by poor calcification of bone and resulting deformities. It resembles rickets in certain symptoms but differs in etiology because it is a degenerative change—a decalcification of bone already formed rather than faulty growth The disease is most common in women during pregnancy and finds its highest incidence in the Orient among peoples subsisting largely upon cereals. This diet has a low calcium but high phosphorus content and is almost devoid of vitamin D. The disease is uncommon among people who have an abundance of food or among the poor who are agricultural workers exposed to sunshine It occurs among the poorer middle classes who have neither good food nor sunshine.

Treatment and Prevention. Dietary histories of cases of osteomalacia almost always disclose multiple deficiencies Diet for such persons must be adequate in all respects, special attention being paid to a liberal amount of good-quality protein, as well as the bone-building minerals and vitamin D. Milk, milk products, meat, eggs and legumes are both preventive and curative Fish-liver oil or other concentrates of vitamins A and D usually are prescribed along with a good diet.

DENTAL CARIES

Incidence. Contrary to the endemic or regional incidence of some other deficiencies, dental caries is so common that few readers have not experienced it themselves It is rare indeed to find adults with absolutely perfect teeth. Figures on incidence of dental caries among population groups vary according to locality, but they are higher than for any other disease discussed in this chapter Authorities estimate that only 2 per cent of the people in the United States have escaped having at least one dental cavity. The national cost of restoring or correcting dental defects is enormous and a big item in most family budgets.

Etiology. Dental caries has been variously attributed to inheritance, metabolic disturbances, specific or multiple-food deficiencies, local conditions in the mouth, including composition of saliva, and lack of fluorine in the water supply. None of these entirely explains the high incidence or varying degree of susceptibility to caries encountered among children of the same family with similar dietary and mouth-hygiene habits.

Prophylaxis. The confusion which

Whether the action is local or systemic, or both, the fact remains that a diet liberal in fruits, vegetables and milk is less likely to promote dental caries than is one high in cakes, cookies and candy. It is especially recommended that some raw fruit or vegetable be eaten at the end of each meal rather than the usual concentrated sweet dessert. The cleansing action on teeth of raw fruits and vegetables is well recognized. The group of investigators who consider that the regular intake of a well-balanced diet is of major importance argue that such a diet maintains high general resistance of body tissues. It is a difficult theory to prove but a practical one to follow until further research indicates the specific factors involved The important role of calcium and phosphorus in the formation and

bone in many respects, and that an abnormal calcium-phosphorus metabolism or a vitamin D deficiency predisposes that individual to dental decay. Such deficiencies during or preceding the eruption of the teeth undoubtedly account for some faults in structure, but

mal enamel.

Another group of workers places great

periments with animals show that a lack of vitamin C affects the gums and predisposes to mouth infection. Loosening of the teeth is a recognized accompaniment of scurvy.

A large group believes that the initial process of tooth decay is brought about by the action of acid on the surface of the teeth. There is evidence that this acid is formed on protected areas of the teeth by the growth of micro-organisms, such as *Lactobacillus acidophilus*, which are capable of fermenting carbohydrate to form lactic acid. Carbohydrate foods of such consistency that particles lodge in the crevices of the teeth furnish a favorable medium for the growth of such acid-producing bacteria. Lowered incidence of caries in children has been observed repeatedly when the intake of candy and sweetened foods was restricted and the use of natural fruits was encouraged, contrariwise, caries has been shown to increase in children when sugars and pastries were added to their diet under controlled conditions

restriction and a marked increase since sweets again became available. However, the younger children, whose teeth developed during the period of low sugar intake, show a caries reduction in the postwar period, when sugar consumption is again high Thus, the evidence suggests that the structure of the teeth themselves is important in determining the subsequent caries incidence.

Accumulating evidence[11, 12] of the close correlation of the incidence of dental caries and the fluorine content of the

[11] Dean, H. T.: Am. J. Nursing 52.210, 1952.

[12] Ast, D. B, *et al.*: J. Am. Dietet. A. 52.291, 296, 307, 1956

drinking water has given impetus to the use of fluorine as a prophylactic agent Long-term experiments, such as those now in progress in Newburgh and Kingston, N. Y, Grand Rapids, Mich., and others which are well-controlled, are most encouraging. It is generally agreed that fluorine is the only known agent ordinarily included in food or water that is capable of exercising mass control of dental caries However, the control is really effective only during the period of calcification It may have a slight inhibitory effect in adolescents and adults

Among the authorities who have [illegible]

fluoride is through the fluoridation of the drinking water. A special committee of the National Research Council[13] has concluded: "In view of these considerations, your Committee recommends that any community which includes a child population of sufficient size, and which obtains its water supply from sources which are free from or are extremely low in fluorides, should consider the practicability and economic feasibility of adjusting the concentration to optimal levels. This adjustment should be in accord with climatic factors and a constant [illegible]

The level of fluorine which seems to [illegible]

rine in the water supply exceeds 2 ppm, as it does naturally in certain communities in several Western states. Indeed, it was the absence of caries in people with mottled enamel that first called attention to its protective action.

[13] Ad Hoc Committee on Fluoridation of Water Supplies, Maxcy, K. F., Ch. Nat. Research Council, 1951.

HEMORRHAGIC DISEASE OF INFANTS

Incidence and Etiology. A hemorrhagic disease of infants may be due to a lack of vitamin K. The deficiency is uncommon in adults, except when something interferes with the absorption of fats and the fat-soluble vitamins which accompany them. A lack of bile flow into the intestine will interfere seriously with vitamin K absorption The continuous use of mineral oil as a laxative is also known to interfere with vitamin K absorption In fact, depletion of vitamin K, due to mineral oil taken during pregnancy, has caused a manifest deficiency in both mother and infant.

Pathology. The slow clotting time of the blood characteristic of this condition is due to too little prothrombin, the clotting agent in the blood. Vitamin K (Koagulationsvitamin) was first shown to hasten the clotting time in chicks and subsequently was found to be essential for the formation of prothrombin

Treatment. The use of vitamin K in [illegible] are adequate for most people. (*See* Chap. 7)

NUTRITIONAL ANEMIA

Anemias may be caused by nutritional deficiencies, metabolic disturbances or loss of blood by hemorrhage. Only the first type is likely to be considered a true deficiency; the others may be called conditioned malnutrition. Anemia may occur secondary to general malnutrition and other deficiency diseases (*see also* pellagra, scurvy and hemorrhagic disease of infants in this chapter). Formerly, nutritional anemia was associated chiefly with iron deficiency, but now it is recognized that possibly protein and



Fig 69. Goiter in a young boy from mountains of Brazil, where the goiter problem is still serious (Diviseo de Organizacao Sanitaria, Brazil)

vitamins A and C are involved. The iron story is discussed more fully in Chapter 6

Anemia is far more common among females than males, and occurs when requirements are greatest and the drain upon stores of iron and other necessary factors is heaviest, i e., during adolescence, pregnancy and following hemorrhage or wasting disease Infants of either sex may develop anemia as a result of poor prenatal nutrition or insufficient food supplements during the nursing period Other types of anemia, and especially the relation of vitamin B_{12} and folacin to the macrocytic anemias, are discussed in Chapter 29.

SIMPLE, OR ENDEMIC, GOITER

Common, or simple, goiter usually is attributed to an iodine deficiency in food. Since iodine in surface soil shows a very uneven distribution and plants absorb iodine from the soil, the iodine content of foodstuffs varies with the locality in which they are grown. Thus we find simple goiter most common in those parts of the world where the surface soil is low in iodine. Due to increased facilities for food distribution in the United States today, city people are less confined to food grown in one locality and the incidence of simple goiter seems to be decreasing.

Iodized salt, which is on the market in most goitrous regions, has also proved to be beneficial in reducing the incidence of goiter, as evidenced by examination of schoolchildren. In one state in *which goiter was almost eliminated*, it again became more prevalent when the emphasis on the use of iodized salt was relaxed. If the spectacular decrease in the incidence of goiter which resulted from the use of iodized salt is to continue, more publicity must be given to it, and its use in goitrous sections of the country must be encouraged. (*See* Chap. 6, Iodine, and Chap. 31, Hypothyroidism.)

EARLY DIAGNOSIS AND TREATMENT OF NUTRITIONAL FAILURE

Individuals with mild forms of deficiency diseases which usually are not recognized as clinical entities seldom apply to the general practitioner for medical aid unless more serious conditions develop, furthermore, the physician has not had any adequate criteria for recognizing these early signs. The *insidious development and the delayed* clinical evidence of malnutrition make the problem none the less serious This subject is of great concern to nutritionists, public-health nurses and others, who frequently are in closer contact than physicians with children and with families living on low incomes and an inadequate food supply. There is an open field for further study and observation of these deficiency states among

CLINICAL SIGNS OF NUTRITIONAL FAILURE AND SUGGESTED DEFICIENCY

FINDINGS	SUGGESTED DEFICIENCIES
General	
Underweight	Calories, protein, Ca, P, vitamins
Underheight (T)	
Pallor (T)	Iron, folic acid, B_{12} ascorbic acid
Lack of appetite (N)	B complex, unknown
Skin	
Inflammation (perifolliculosis) (N)	Ascorbic acid, vitamin A
Hardening around hair follicles (follicular hyperkeratosis)	Vitamin A
Dermatitis of pellagra (N)	Niacin
Abnormal sebaceous secretion (dyssebacea) in nasolabial folds, behind ears and in body folds (N)	Riboflavin, unknown
Acne vulgaris (T)	Unknown, riboflavin
Hemorrhagic manifestations, petechiae, bruises, etc. (N)	Pyridoxine, vitamin A, ascorbic acid, vitamin K, unknown
Eyes	
Bloodshot (corneal vascularity)	Unknown, riboflavin
Inflammation (conjunctivitis) (T)	Vitamin A, unknown
Night blindness (nyctalopia)	Vitamin A
Light sensitivity (photophobia)	Vitamin A, riboflavin
Lips and Mouth	
Cracked lips (cheilosis) (N)	Riboflavin, B complex, pyridoxine
Inflammation of mouth (stomatitis) (N) with cracking at corners	Riboflavin, B complex, iron, niacin
Inflammation of tongue (glossitis) (N)	B complex, protein
Edema of tongue	Niacin, unknown
Teeth	
Caries (N)	Unknown
Malocclusion (T)	Vitamin D, unknown
Scorbutic gums (N)	Ascorbic acid
Gingivitis	Ascorbic acid, unknown
Skeletal	
Rachitic deformities—"squared" head, beaded ribs, bowed legs, knock knees (N)	Vitamin D, Ca and P
Osteomalacia in adults	Vitamin D, Ca and P
Nervous	
Nutritional polyneuritis	Thiamine, B complex
Combined system disease	B complex, vitamin B_{12}
Degenerative brain disease (encephalopathic states)	Thiamine, niacin, B complex, unknown
Circulatory	
Beriberi heart disease	Thiamine
Nutritional edema (T)	Protein, thiamine, famine
Endocrine	

all groups of the population, but especially among the lower-income groups, in which the vicious circle of malnutrition, lack of strength and ambition, and continued low income offers little opportunity for real improvement.

Several attempts have been made to tabulate the signs and the symptoms associated with specific deficiencies. Jolliffe, Tisdall and Cannon[14] offer helpful descriptions and pictures of deficiency states. As they say. "Most physicians are familiar with the signs of advanced florid deficiency disease as they *occur in classical starvation, protein deficiency*, osteomalacia, rickets, scurvy, pellagra and beriberi. Most malnutrition, however, is not this advanced, easily recognized variety but is mani*fested by signs less fully developed, less* severe, or less acute than the classic textbook descriptions imply These lesser signs are frequently overlooked. Consequently much malnutrition remains [illegible]

[illegible] teachers can help in detecting early signs of malnutrition, which should be brought to the attention of the physician.

Recognizing the need for more experience in judging nutritional status by clinical signs, the National Research Council sponsored a Medical Survey of Nutrition in Newfoundland, where nutritional deficiencies of several types were common. The technics used in such a *rapid survey of population* groups were reported[15] in detail with colored plates of eye, mouth and skin conditions indicative of deficiencies A resurvey conducted in 1948,[16] 4 years after the first one, resulted in pertinent findings, indicating marked improvement, as described in Chapter 1. Thus, by the technics used, it was possible after a 4-year interval to make comparable observations, even when some of the observers had not participated in the first survey.

[14] Jolliffe, Tisdall and Cannon Clinical [illegible] New York Hoeber 1950.

[illegible] 1949.

STUDY QUESTIONS

1. When near-starvation conditions bring multiple deficiencies, which ones are apt to show up first and what should be the emphasis of relief feeding in order to do the most good for the greatest number of people?

2. If you were working in a Southern climate and encountered children who had pot bellies and were listless and inactive, would you suspect rickets or some other deficiency, and why?

3. Which deficiencies are more apt to show up in children and which in adults? How will symptoms of the same deficiency vary with age or sex?

4. Is there any evidence that education with a view to better nutrition of children during the past few decades has reduced certain deficiency diseases? If so, which ones?

5. Skin lesions and gastro-intestinal disturbances are symptoms of a deficiency disease which occurs in low-income families in our Southern states. Which specific deficiencies and food habits predispose to this condition and what is it called?

6. Families of fishermen in Labrador suffered from chronic constipation and some people used to become partially paralyzed during the winter months. Which deficiency was probably involved, and which members of the family were apt to show the paralysis first?

7. If dental caries was conspicuously less in children of a given community than in surrounding areas, what would you suspect as the protective factor, and why?

8 At what age is kwashiorkor apt to occur, and why? What other names are applied to a similar syndrome in other parts of the world?

9. Mild forms of deficiency diseases undoubtedly occur more often than is known Why are they not diagnosed earlier? What progress has been made toward earlier recognition of nutritional failure?

See Bibliography in Part Four for other pertinent material on the topics discussed in this chapter.

CHAPTER TWENTY-ONE

Overweight and Underweight

LIFE EXPECTANCY AND BODY WEIGHT

The question of body weight is becoming a major public health problem. Until a relatively few years ago, public health workers were concerned with the control of communicable diseases and infections. Many of these have yielded to the new weapons of medical science and to persistent health education efforts As a result, other conditions now are becoming major public health problems. Among these are overweight and, to a lesser extent, underweight.

No one knows how many people in our population are overweight, nor exactly what direct bearing weight has on mortality. But it is known, from studies of life-insurance figures, that overweight people develop diabetes, heart disease, high blood pressure, kidney disease and other life-shortening conditions earlier, and are likely to die younger than people of normal weight They run a greater risk when surgery is necessary and also seem to have less resistance to infections. Complications in pregnancy occur more frequently in overweight women than in those whose weight is normal.

On the other hand, weight too far below normal is not desirable. Underweight people often suffer from fatigue, have poor physical endurance, as well as lowered resistance to infection Tuberculosis especially is found more often

correct weight plays in the preservation of health.

comprehensive article on the subject, based on data from one of our largest life-insurance companies, consider variations within 10 per cent above or below

[1] Armstrong, D B, *et al*: J A.M.A 147 1007, 1951.

average weights as normal, 10 to 20 per cent above average as overweight *and more than 20 per cent above average* as obesity Twenty per cent or more below average is regarded as dangerously underweight.

The conception of what constitutes average weight itself has undergone a revision The older weight tables for adults were based on height and age and allowed for an increase in weight *with increasing age* They have now been discarded Today, for men and women over 25, a fixed set of standards is recommended. This standard is based on the average weight at the ages of 25 to 30 and allows for differences in bodily [illegible]

[illegible]

OBESITY

As has already been indicated, obesity [illegible]

[illegible]

Causes

Obesity generally is due to an excessive food intake, often accompanied by sedentary habits Some investigators[2, 3] have shown that *there is* a tendency for obesity to be associated with physical inactivity, particularly in younger people The factors influencing excessive food intake are not clearly understood, and may range all the way from a social habit of eating more than one needs to satisfying some deep-felt psychological need for food.

[2] Johnson, M L., *et al*. Am. J. Clin Nutrition 4 35, 1956

[3] Mayer, J: J. Am. Dietet. A. 31:272, 1955

In a small percentage of patients the [illegible]

thyroidism) or the pituitary. Obesity should not be attributed to glandular deficiencies except by thorough physical examination

In recent years there has been renewed interest in the normal physiologic controls of appetite and satiety. *Most individuals maintain a balance be*tween food intake and energy expenditure which keeps their weight comparatively stable over a period of many years It has been postulated that there is an "appetite center" in the hypothalamus, a small area in the brain, closely connected with the pituitary gland. We know that if one tiny area in the hypothalamus *is* destroyed in an experimental animal, voracious appetite and extreme obesity result Conversely, if an adjacent, equally small area in this region is destroyed, the experimental animal refuses to eat, even when food is placed in its mouth There are many other factors which suggest that the [illegible]

[illegible]

is known to give a clear picture, but new findings may help us eventually to understand some of these problems. Berryman,[4] in a discussion of this and other possible causes of obesity says "The fact that *mere speculation on* the causes of obesity is now being amplified by clinical and laboratory investigation is encouraging and highly desirable"

Exercise

Exercise is important, since it increases the oxidation of the fat. Walking is excellent A 300-lb. man, walking 3 miles per hour, will consume about 330

[4] Berryman, G H.: J. Am. Dietet. A. 31·347, 1955.

Life Expectancy and Body Weight
Obesity
  Causes
  Exercise
  Dietary Control
  Psychological Factors
  Low Caloric Diets
Underweight
  Diet for Underweight
  High Caloric Diet
  Anorexia Nervosa

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They run a greater risk when surgery is necessary and also seem to have less resistance to infections Complications in pregnancy occur more frequently in overweight women than in those whose weight is normal.

On the other hand, weight too far below normal is not desirable Underweight people often suffer from fatigue, have poor physical endurance, as well as lowered resistance to infection Tuberculosis especially is found more often among underweight people than among those of normal weight. There seems to be no doubt that more attention should be paid to the important role which correct weight plays in the preservation of health

The meaning of the terms *overweight*, *obesity* and *underweight* are ill defined. Armstrong and his co-workers,[1] in a comprehensive article on the subject, based on data from one of our largest life-insurance companies, consider variations within 10 per cent above or below

[1] Armstrong, D B, *et al*: J A M.A 147. 1007, 1951.

average weights as normal, 10 to 20 per cent above average as overweight and more than 20 per cent above average as obesity Twenty per cent or more below average is regarded as dangerously underweight

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[illegible] by many institutions and physicians They will be found in Part Four, Table 10

OBESITY

As has already been indicated, obesity is one of the more serious health hazards [illegible]

[illegible]

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[illegible]

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In recent years there has been renewed interest in the normal physiologic controls of appetite and satiety. Most individuals maintain a balance between food intake and energy expenditure which keeps their weight comparatively stable over a period of many years. It has been postulated that there is an "appetite center" in the hypothalamus, a small area in the brain, closely connected with the pituitary gland. We know that if one tiny area in the hypothalamus is destroyed in an experimental animal, voracious appetite and extreme obesity result Conversely, if an adjacent, equally small area in this region is destroyed, the experimental animal refuses to eat, even when food is placed in its mouth. There are many other factors which suggest that the hypothalamus may be involved in the balance of appetite and satiety and, therefore, in the maintenance of normal weight, and possibly in the development of obesity. At present too little is known to give a clear picture, but new findings may help us eventually to understand some of these problems. Berryman,[4] in a discussion of this and other possible causes of obesity says. "The fact that mere speculation on the causes of obesity is now being amplified by clinical and laboratory investigation is encouraging and highly desirable"

Exercise

Exercise is important, since it increases the oxidation of the fat. Walking is excellent. A 300-lb man, walking 3 miles per hour, will consume about 330

[2] Johnson, M L., *et al.*: Am J Clin. Nutrition 4 35, 1956

[3] Mayer, J J Am Dietet. A. 31 272, 1955

[4] Berryman, C. H.: J Am Dietet A. 31.347, 1955

CALORIC VALUES FOR COMMON "SNACK" FOODS

	AMOUNT OR AVERAGE SERVING	CALORIE COUNT
"Just a Little Sandwich"		
Hamburger on bun	3-in. patty	330
Peanut butter	1 tbsp. P.B.	330
Cheese	1 oz. cheese	280
Ham	1 oz. ham	320
Beverages		
Carbonated drinks, soda, root beer, etc.	6-oz. glass	80
Cola beverages	12-oz. glass (Pepsi)	150
Club soda	8-oz. glass	5
Chocolate malted milk	10-oz. glass (1¼ c.)	500
Ginger ale	6-oz. glass	60
Tea or coffee, straight	1 c.	0
Tea or coffee, with 2 tablespoons cream and 2 teaspoons sugar	1 c.	90
Alcoholic Drinks		
1 Ale	8-oz. glass	130
1 Beer	8-oz. glass	110
1 Highball (with ginger ale—ladies' style)	8-oz. glass	185
1 Manhattan	Average	165
1 Martini	Average	140
Wine, Muscatel or Port	2-oz. glass	160
1 Sherry	2-oz. glass	60
Scotch, bourbon, rye	1-oz. jigger	105
Fruits		
Apple	1 3-in.	75
Banana	1 6-in.	130
Grapes	30 medium	75
Orange	1 2¾-in.	70
Pear	1	65
Salted Nuts		
Almonds, filberts, hazelnuts	12-15	95
Cashews	6-8	90
Peanuts	15-17	85
Pecans, walnuts	10-15 halves	100

(Adapted from Smith, Kline and French Laboratories)

calories, or the equivalent of 1¼ ozs of body fat (*see* Chap. 5). Daily gymnastic exercises are also effective. The only drawback about exercising to reduce is that the appetite is increased and, if entirely satisfied, will more than overbalance the calories lost in exercise. Strenuous exercise may be dangerous for the obese, especially if they are past middle life. The type and the amount of exercise should depend upon the age and the specific condition other than the obesity. In cardiovascular diseases exercise must be limited.

Caloric Values for Common "Snack" Foods (*Continued*)

	Amount or Average Serving	Calorie Count
Candies		
Chocolate bars, 5 cent size:		
Plain, sweet milk	1 bar (1 oz.)	155
With almonds	1 bar (1 oz)	140
Chocolate-covered bar	1 bar	270
Chocolate cream, bon bon, fudge	1 piece 1-in square	90-120
Caramels, plain	2 medium	85
Hard candies, Lifesaver type	1 roll	95
Peanut brittle	1 piece 2¼ x 2½ x ⅜ in	110
Desserts		
Pie		
Fruit—apple, etc	⅙ pie 1 average serving	375
Custard	⅙ pie 1 average serving	265
Mince	⅙ pie 1 average serving	400
Pumpkin pie with whipped cream	⅙ pie 1 average serving	460
Cake:		
Chocolate layer	3-in. section	350
Doughnut, sugared	1 average	150
Sweets		
Ice Cream.		
Plain vanilla	⅙ qt. serving	200
Chocolate and other flavors	⅙ qt., ⅔ c	260
Orange sherbet	½ c.	120
Sundaes, small chocolate nut with whipped cream	Average	400
Ice-cream sodas, chocolate	10-oz glass	270
Midnight Snacks for Icebox Raiders		
Cold potato	½ medium	65
Chicken leg	1 average	88
Glass milk	7-oz. glass	140
Mouthful of roast	½ in x 2 in. x 3 in.	130
Piece of cheese	¼ in x 2 in x 3 in	120
Leftover beans	½ c.	105
Brownie	¾ in. x 1¾ x 2¼ in.	140
Cream puff	4 in diam	450

Drugs

Drugs or proprietary preparations to decrease the weight never should be taken without the consent and the supervision of the physician.

extract, which, being a natural, or physiologic, product, was thought to be safe, but it soon proved to be quite the contrary, except in certain well-controlled situations

A group of drugs, derivatives of amphetamine, have been found helpful in promoting weight loss. They stimu-

late metabolism and help to burn the excess fat somewhat faster than would otherwise be the case They should always be used in conjunction with a low caloric diet and always under the direction of a physician

Common laxative salts sold under a variety of fancy trade names or laxative drugs sold as harmless remedies all accomplish similar results—the loss of large volumes of water through the stools. The sudden weight reduction is due to loss of water, not fat, and both the water and the resulting weight will be regained promptly as soon as water is consumed Furthermore, permanent injury to the intestine and the digestive function may result from the repeated use of such drastic treatment. Proper laxative agents have their place in medical practice, but not as obesity cures

Dietary Control

Since adipose tissue is a storage for excess fuel food, the caloric intake must be below the actual daily needs if the body is to draw upon and reduce its reserve supply of body fat.

Caloric Need. In planning a reducing diet, the first consideration should be the determination of the normal caloric needs of the individual based on his ideal weight for height, sex, body build and degree of activity. For adults, this will vary from about 2,000 to 3,000 calories for moderate activity. The caloric value in a reducing diet may safely be cut from one fourth to one third, although it seldom is advisable to go below 1,200 calories unless there is

be reduced However, there is considerable difference of opinion as to whether carbohydrate or fat should be cut to a minimum. The usual low caloric diet will derive approximately half its calories from carbohydrate, as in the normal diet, and reduce the fat intake to a minimum The advantage of this division is that it follows the natural pattern of carbohydrate intake.

Recently, Young[5] and Cederquist and her co-workers[6] advocated a diet low in carbohydrate and moderate in fat content. They claim that patients find that such a diet has greater satiety value and, therefore, is easier to follow. This will be discussed at greater length later in this chapter.

Protein is needed at all times for repair of body tissues, but when this demand has been met the remainder is used as a source of energy or heat production Since a liberal amount of good-quality protein is needed to maintain nitrogen balance on a low caloric diet, it is evident that protein should form a relatively large portion of a reducing diet One gram of protein per kilogram of normal weight, or approximately 70 Gm. of protein per day for adults usually has been regarded as the normal allowance, but some doctors now advocate a higher intake McLester[7] advises an intake of from 1 0 to 1.5 Gm. protein per kilogram of body weight. This allows for the inclusion of more meat, fish, eggs and cottage cheese, all of which have high satiety value.

Minerals and Vitamins. Care should be taken to see that the foods supplying calories contain all the other essentials of a normal diet, such as vitamins, minerals and bulk in quantities at least equivalent to those of a normal diet. If the total calories are very low,

[5] Young, C · J. Am. Dietet A 28 410, 1952

[6] Cederquist, D C, *et al.* J Am Dietet. A 28 113, 1952

[7] McLester, J S, and Darby, W. J: Nutrition and Diet in Health and Disease, ed. 6, Philadelphia, Saunders, 1952

supplements such as vitamins and mineral concentrates are indicated

Alcohol. Since 1 gram of alcohol provides 7 calories, and since many alcoholic beverages contain carbohydrate in some form as well, they should be severely limited or entirely omitted.

Satiety Value of Foods. One of the greatest problems of obese patients is that they are in the habit of eating frequently and in more than average quantities A glance at the table of "snack" foods on pages 262 and 263 will show how easy it is to add calories without being aware of it It is essential, therefore, that the low caloric diet be as satisfying as possible That "all gone" feeling which is so often experienced when the food intake is limited may be so severe as to cause real discomfort and become a *strong temptation to overstep* the prescribed diet It has already been indicated that markedly decreasing the carbohydrate intake and allowing a moderate amount of fat may help to solve this problem. Also, protein foods, especially those very low in fat, such as skim milk and cottage cheese taken in limited quantity between meals, may satisfy the feeling of hunger without appreciably increasing the caloric intake Broth has little food value and may be taken as desired. Fruit gelatins made with saccharin or Sucaryl may satisfy a craving for sweets (*See* Chap 50 for recipes)

Water may be taken in moderation with meals, and more freely between meals, unless restricted because of some heart or kidney complications

Psychological Factors in Obesity

Many patients who are overweight eat because they have nothing else to do. They may eat when they are under strain or when they feel unappreciated. They may eat because plenty of food denotes prosperity or success in life, quite apart from the physiologic sense of satiety. The nurse or the dietitian must be prepared to give the obese patient a sense of worth by continued encouragement, even when there is *occasional failure in holding to the diet.* It must be remembered that an individual accustomed to overeating for many years will not find it easy to conform to a rigorous low caloric regimen.

Faddist Diets and Nutritional Adequacy

As has already been stated, it is important that the reducing diet continue to meet the National Research Council Allowances for adequate nutrition A glance at the accompanying 1,200 calorie diet will show that this may not be easy. Extremely restricted diets, such as often become fashionable for a time, may take off pounds, but they may also undermine the health of the individual It is necessary to establish a new pattern of eating, with low caloric menus, especially desserts, that are attractive and satisfying (*see* Chap 50 for recipes) Then a person can reduce and *stay reduced because he has established* new habits A sound reduction diet

tions of this pattern are made. It will be noted that bread, cereal and potatoes

low for a man who should weigh 70 Kg. or more, and thiamine and niacin are below the National Research Council

1,200 CALORIE, MODERATE PROTEIN, LOW FAT, MODERATE CARBOHYDRATE DIET

Breakfast	*Lunch*	*Dinner*
½ glass orange juice	1 oz meat or substitute	2 ozs. meat or substitute
1 egg	Beets	Carrots
1 sl. bread	Asparagus	Spinach
1 tsp. butter	½ sl bread	Tomato and lettuce salad
½ glass milk (4 ozs)	1 tsp butter	½ sl bread
Coffee	Strawberries	1 tsp butter
	1 glass milk (8 ozs)	Prunes cooked with saccharin or Sucaryl
		½ glass milk (4 ozs)

reducing the 1,000 calorie diet still further by the omission of 1 slice of bread or equivalent, 1 serving of 9 per cent vegetable and 2 teaspoonfuls butter or margarine

It will be noted that this eliminates

advice and under the supervision of a physician.

Low Caloric Diets with High Protein, Moderate Fat and Low Carbohydrate Content

feelings of hunger and weakness so often complained of by patients on reducing diets.

A typical example of this regimen contains 90 Gm protein, 80 Gm. fat, *80 Gm. carbohydrate and 1,400 calories.* (Compare this with the composition of the 1,200 calorie diet on p. 268). A menu for a day is given on page 269

Meal Planning and Exchange Lists

Lists of nutritive equivalents of the basic food groups were originally designed to aid in the dietary treatment of the diabetic patient and are included in Chapter 22 They will be found to be equally valuable by the patient on restricted calories; they will give his diet as much variety as possible while staying within the caloric prescription.

Maintenance of Weight Loss

Once the ideal weight has been achieved, the patient should be warned not to return to his old dietary habits and should be helped to maintain his

adequately.

Success of Antiobesity Regimens

Because obesity is a serious health problem, much effort has been expended in weight-control programs, and much has been written on the success or the failure of the low calorie regimen to achieve normal weight ranges Reports seem to indicate that the emotional stability of the individual greatly influences his ability to remain on a calorie-restricted diet and maintain *weight loss* Young[8] has shown in a series of studies that the reasonably stable individual is the most likely to achieve successful weight reduction, that the anxious, tense or insecure person is less successful; and that many of those who had little or no success

[8] Young, C., *et al.*: J Am Dietet. A. 31: 1111, 1955.

Low Caloric Reducing Diet

Principle: To meet all the nutritional needs of the individual except in calories

Foods Allowed:

Milk	Milk, buttermilk, skimmed milk as permitted
Cheese	Made of skimmed milk (cottage cheese). Other as permitted
Butter or margarine	Limited to 3 teaspoons a day or less
Eggs	Cooked in all ways except fried or otherwise prepared with butter, cream or fat
Meats, fish, poultry	Lean roast or boiled beef, lamb, veal, pork, chicken, turkey; broiled beefsteak or lamb chops (lean meat only); fish boiled or broiled
Soups	Clear broths and strained soups
Bread, cereals, Italian pastes, potato	Whole grain or enriched as permitted. One slice of bread is approximately equivalent to a medium-sized potato or ½ cup of rice, macaroni, spaghetti or breakfast cereal, and may be substituted for one of these.
Vegetables	These should be restricted to the 3 per cent, the 6 per cent and the 9 per cent carbohydrate groups. (*See* Part Four, Table 3.)
Fruits	All fresh fruits and fruits canned without sugar
Beverages	Milk, buttermilk, skimmed milk as permitted. Coffee, tea or cereal coffee, all without sugar and cream
Desserts	Fruit as above; gelatin desserts made without sugar
Condiments	As desired. Saccharin or Sucaryl may be used as sweetening in place of sugar.

(*See* some suggested recipes for low caloric diets in Chap. 50.)

Foods To Be Avoided:

Fats	[illegible]
Sweet.	[illegible] and desserts. Saccharin or Sucaryl may be used in place of sugar if desired.
Starches	To be limited to those permitted as bread or equivalents
Miscellaneous	Alcoholic and carbonated beverages, popcorn, all other "snack" foods

by adding the following foods to the 1,200 calorie diet each day.

2 sl. bread or equivalent
1 small potato
1 *tsp. butter or other fat*
A choice of ¾ oz. Cheddar cheese, 3 ozs. cottage cheese or 1 egg.

This diet will meet more nearly the National Research Council Allowances. It is also somewhat higher in protein than the 1,200 calorie diet and may be suited best to the needs of men who need to lose weight and to those who are not markedly overweight.

A 1,000 calorie diet may be obtained from a 1,200 calorie diet by substituting skim milk for the whole milk and omitting 1 teaspoonful of butter or margarine.

An 800 calorie diet is achieved by

1,400 Calorie Diet—High Protein, Moderate Fat, Low Carbohydrate*

Breakfast	Lunch	Dinner
½ c orange juice	4 ozs ground beefchuck, cooked	4 ozs pork loin roast, cooked
1 poached egg	Baked squash, 1 serving	Canned beets, 1 serving
1 sl whole-wheat toast	6 ozs whole milk	Water-pack apricots, 1 serving
1 pat butter		6 ozs whole milk
½ glass whole milk		

* Adapted from Young, C Weight reduction using a moderate fat diet, J Am. Dietet A 28 410, 1952

presented deep emotional problems. Stunkard and his co-workers[9] have recently described a so-called "night-eating syndrome," observed in some gravely obese patients. Such a patient [illegible]

of severe emotional stress when an attempt was made to reduce them The investigators concluded that it might be wiser to allow such patients to remain obese than to precipitate an emotional illness

It has been found that obese children often have obese mothers, and that the [illegible]

children early and for a considerable length of time if the condition is not to *become fixed and extend into adult life*

UNDERWEIGHT

Types of Leanness. Leanness or underweight may be due to an inadequate caloric intake. A contributing factor may be excessive bodily activity, which increases the *energy requirements* beyond the caloric value of the food eaten. These people are usually of a so-called nervous temperament. Others are weak (asthenic leanness) with muscles poorly developed and lacking in stamina.

Leanness may be due to some other contributing factor within the body, such as malignancy, gastro-intestinal disorders, chronic infectious diseases and endocrine disturbances An increase in metabolic rate due to hyperthyroidism is frequently a cause of progressive weight loss In such cases, rest and medical treatment or surgery may be necessary, as well as a high caloric diet.

Underweight owing to malnutrition or an inadequate caloric intake may be a serious condition, especially in the young Growth is retarded, efficiency is impaired, and resistance to disease is reduced It has been found that despite the general decrease in tuberculosis in the last few years, the disease has in- [illegible]

25, and is worthy of medical investigation

Diet for Underweight

The usual cause of underweight is an inadequate diet, the inadequacy being due to either the quantity or the quality of the food supply. A deficiency in calories, protein or its component amino acids, minerals or vitamins may produce faulty nutrition with loss of weight A *careful survey of the dietary habits* of the patient should reveal such inadequacies. The most common dietary cause is insufficient fuel value or calories to

[9] Stunkard, A J., *et al*: Am J Med. 19 78, 1955.

[10] Hoffman, R H · Am J Clin. Nutrition 5 1, 1957.

Composition of a 1,200 Calorie Diet[1]

Food Group	Amt. in Gm.	Household Measure	Calories	Protein Gm.	Fat Gm.	Carbohydrate Gm.	Minerals: Calcium Mg.	Minerals: Iron Mg.	Vitamins: A I.U.	Vitamins: Thiamine Mg.	Vitamins: Riboflavin Mg.	Vitamins: Niacin Mg.	Vitamins: Ascorbic Acid Mg.
Milk, whole	488	2 c. (1 pint)	332	17	20	24	576	.4	780	.18	.84	.6	6
Egg	54	1 medium	77	6	6		28	1.3	550	.05	.14		
Meat, fish or fowl[2]	90	3 ozs. cooked	257	23	18	1[3]	9	2.9	4,815[3]	.24	.51	5.7	8[3]
Vegetables:													
Deep green or yellow, cooked[2]	225	3 servings	54	6		12	117	2.1	9,900	.18	.27	1.5	63
Other, cooked[2]	150	2 servings	78	4		18	30	1.2	380	.14	.12	1.4	20
Fruits:													
Citrus[2]	100	1 serving	41	1		10	20	.3	95	.06	.02	.2	44
Other[4]	200	2 servings	140	2		36	32	1.8	900	.06	.12	1.2	40
Bread, white, enriched	46	2 slices	126	4	1	24	36	.8		.12	.08	1.0	
Butter or margarine	14	1 tablespoon	100		11		3		460				
Totals			1,205	63	56	125	849	10.8	17,880	1.03	2.10	11.6[5]	178
Compare with recommended allowances[6]												Niacin Equiv.	
Moderately active man (70 Kg., 25 yrs. old)			3,200	70			800	10.0	5,000	1.60	1.80	21	75
Moderately active woman (58 Kg., 25 yrs. old)			2,300	58			800	12.0	5,000	1.20	1.50	17	70

[1] Calculations from Table 1, Part Four, Composition of Foods.
[2] *See Pattern dietary, page 000, for basis of evaluations.*
[3] Only if 100 Gm. liver is included once in 10 days.
[4] Evaluation based on figures for fresh strawberries, bananas, cooked unsweetened prunes, water-pack peaches
[5] *The addition of coffee will add approximately 1 mg. niacin per cup.*
[6] From the National Research Council Recommended Dietary Allowances, revised 1958.

salad oils, are more easily digested than the fat in fried foods

It will be noted that the above diet is a house, or regular, diet supplemented with cream, extra butter, high caloric desserts and nourishment between meals

Nursing Problems

The diet must be built up gradually, otherwise the patient may not be able to tolerate the sudden increase Care must be taken to ascertain the likes and the dislikes of the patient and to prepare the food as appetizingly as possible, both as to methods of cooking and appearance when served. Above all, the patient must be encouraged to accept the necessity for co-operating by consuming all food served to him Low caloric soups, salads and beverages should not be eaten at the beginning of a meal, as they tend to give temporary satiety and to diminish appetite for the more substantial part of the meal.

Anorexia Nervosa

A very severe form of underweight is occasionally found in young people, most frequently young women, which is due to mental illness. Although these patients may seem to be physically well, and may protest that they eat sufficient amounts of food, they are often 30 per cent or more underweight, and their actual food intake is negligible. Since rejection of food is part of their illness, it is best not to press the need for calories on such patients but to serve pleasing meals without comment, in the hope that, as they recover, their food intake will increase.

STUDY QUESTIONS

1 Why is obesity becoming a matter of concern to those in the field of public health?

2. *What is the role of the nurse in* helping a patient to maintain a reducing diet?

3 What are the underlying principles of a low caloric diet?

4 Which foods must be omitted on a low caloric diet? Which must be limited?

5. Which equivalents may be substituted for a slice of bread?

6 Plan several menus for a 1,500 calorie reducing diet for (a) a man who carries his lunch to work, (b) a man who works nights, and (c) for either of these men on Sundays or holidays

7. Which foods are of value in a low caloric diet to give it high satiety value?

8 What besides diet may be helpful in bringing about reduction of weight? What may be harmful?

9 What relationship does there seem to be between *the emotional stability* of an individual and his ability to persist in a low caloric diet? Are there some patients who are best left alone?

10 What are some of the reasons for a person's being underweight?

11 What additions can you make to a regular diet to increase it by 1,000 calories? Use Table 1, Part Four, for determining caloric values

12 A patient who should weigh 140

for him for a week.

13 What should the nurse's attitude be toward a patient suffering from anorexia nervosa?

See Bibliography in Part Four for other pertinent material on the topics discussed in this chapter.

High Caloric Diet for Underweight

Principles:

1. [illegible]
2.
3.
4.

Foods Allowed:

Milk	Milk and cream in abundance
Cheese	All kinds
Fats	Butter and margarine used freely; all other fats
Eggs	Cooked in all ways
Meats, fish and fowl	All varieties, bacon and fat meats are indicated if the patient tolerates them
Soups	Preferably creamed or thick soups
Bread, cereals, Italian pastes	All kinds, preferabl[illegible]
[illegible]	[illegible] fruit desserts, other simple desserts
Beverages	Tea, coffee, cocoa, served with cream and sugar, fruit juices (lactose may be added); malted preparations
Vitamin concentrates	If ordered by the physician

(*See* Chap. 50 for high caloric foods and beverage recipes.)

meet the energy requirements. Therefore, calories must be increased Not only must the normal requirement be met, but an increase of from 400 to 800 calories must be made to allow for storage Fifty per cent above the normal is sometimes prescribed

Vitamin supplements are sometimes prescribed, especially thiamine chloride, for stimulating the appetite and improving digestion

The objectives of this diet are:

1. *An adequate diet, as prescribed in* Chapter 18

2. Additional calories, which may be obtained by (a) increasing the quantity of the foods listed in the normal pattern, by (b) increasing the carbohydrates and, to some extent, the fats, and by (c) frequent feedings to include nourishment between meals and before retiring at night.

3 An increase in protein to approximately 90 to 100 Gm. for adults in order to combat the deficiency due to previous malnutrition with loss of body tissue.

4. An abundance of vitamins and minerals, especially thiamine.

5 *A reduction in bulk*, if not needed as a laxative, in favor of foods with higher caloric value.

6. Easily digested foods. Carbohydrate-rich foods are especially indicated, since carbohydrate is both easily digested and quickly converted into body fat. Foods rich in fat may be used to increase the fuel value without unduly increasing the bulk, but they must be used with discretion Greasy foods will lessen the appetite of many patients, and too much fat in any form is frequently distasteful unless cleverly disguised. The uncooked fats, such as cream, butter and

either by familial factors or racial predisposition Hundley,[1] in an excellent review of the problem, suggests that the possible combination of American food habits, lack of physical activity because of our many labor-saving devices, and the prevalence of obesity may well create a "diabetes susceptibility" in this country. Certainly it is known that overweight is a predisposing factor Joslin[2] found, on reviewing 1,000 cases of diabetes, that 75 per cent were above the normal weight range

Diabetes is primarily a disease of [illegible]

atherosclerosis or some other old-age phenomenon. The onset of this disease generally is slow and insidious, but it may be sudden

SYMPTOMS

[illegible]

2. Extreme thirst, known as polydipsia.

3 Dehydration, due to polyuria

4. Excessive hunger, known as polyphagia.

5 Loss of strength.

6. Loss of weight.

Upon arrival at the doctor's office a patient with the foregoing symptoms will usually have blood and urine analyses for sugar. In all probability he will be found

7 To show sugar in the urine

8 To show increased sugar in the blood

9 To be sufficiently ill to require emergency treatment if he is in a state of ketosis (or acidosis) or perhaps even coma

[1] Hundley, J. M · J. Am Dietet. A 32 417, 1956

[2] Joslin, E. P: Diabetic Manual, ed 9, Philadelphia, Lea & Febiger, 1953.

DIAGNOSTIC TESTS

The laboratory findings are always the determining factors in the diagnosis of diabetes The examination of the urine includes tests for.

1 Volume
2 Specific gravity
3 Glucose.
4 Ketone bodies

The normal volume excreted daily varies, of course, with the amount of fluids consumed and the amount lost through evaporation or perspiration. The normal limits, however, lie roughly between 1,200 cc and 2,000 cc (1-2 quarts) for a 24-hour period If sugar is present, the volume usually is increased, the total volume often exceeds 3,000 cc in severe cases Joslin reports a patient who excreted more than 7,000 cc in 24 hours.

Specific Gravity of the Urine

Specific gravity is a measure of the density of a liquid as compared with an equal volume of water The density of 1 cc of water is considered to be 1 000. The density, or specific gravity, of normal urine averages from 1 008 to 1.030 per cc. The increased density depends on the amount of dissolved substances in the urine. The solids in solution are chiefly urea and salts, and in diseases of the kidneys, albumin. When the total solids of the blood exceed the normal concentration point, the body excretes a larger volume of urine, which is followed by thirst and increased intake of fluids. When large quantities of sugar are excreted, the density, or specific gravity, of the urine may be increased above 1.030 The total volume is also increased.

Sugar in the Urine

Sugar in the urine, except when found in mere traces, is strongly indicative of

CHAPTER TWENTY-TWO

Diabetes Mellitus

Diabetes mellitus is a chronic disease, the history of which goes back many centuries The word *diabetes* was [illegible]

Thus the copious urination and sugar in the urine, the two most characteristic symptoms, gave the name to the disease.

Diabetes mellitus, or sugar diabetes, is concerned with carbohydrate metabolism in which the whole endocrine system is involved, and particularly the [illegible] inability of the body to utilize carbohydrate normally. The carbohydrate which is not burned accumulates in the blood stream, a condition known as hyperglycemia, and is excreted later in the urine Sugar in the urine is known as glycosuria.

It will be remembered that the pancreas plays an important role in the process of digestion It produces an external secretion known as pancreatic juice and an internal secretion known as insulin. The external secretion aids in the digestion of protein, fat and carbohydrate in the intestine. The internal secretion is the principal factor in the utilization of carbohydrate by the body cells. The insulin is secreted by special cells of the pancreas which are arranged in clusters known as the islands of Langerhans.

CAUSES OF DIABETES

Exactly what causes diabetes is not known, but there seems to be a strong hereditary tendency. The disease "runs in families." Frequently a person with diabetes knows of other members of his family who have the disease or had it when living. It also seems to afflict certain races, particularly the Jewish race. In the United States there is a high incidence of diabetes not accounted for

ard diet will be based on the carbohydrate value of the diet used prior to the appearance of urinary sugar. This amount, if much below normal needs, probably will be increased somewhat and insulin prescribed to aid in its metabolism, as described later in this chapter.

PHYSIOLOGIC EXPLANATION OF BODY CHANGES

How Glucose Gets Into the Blood and the Urine

Glucose and Glycogen. Carbohydrates such as starch, cane sugar (sucrose) and milk sugar (lactose) enter the body as food After being acted upon by the saliva, the pancreatic and the intestinal juices, they are changed to so-called monosaccharides, or simple sugars, that pass readily through the intestinal walls into the blood stream and soon reach the liver through the portal circulation The principal sugar formed is glucose, although there may be some fructose and galactose, all of which are transformed into glycogen when they reach the liver, as already stated in Chapter 2 The liver then allows a portion of this glycogen, reconverted to glucose, to pass into the blood stream to maintain the normal blood-sugar level of 70 to 100 mg per 100 cc of blood and to be carried to the tissues as rapidly as there is need for it to be stored as muscle glycogen. Insulin, the internal secretion of the pancreas, is one of the controlling factors in this regulatory action, including the conversion of glucose to glycogen and its utilization by the tissues

Recently a new hormone—glucagon—also thought to be produced in the pancreas, has been isolated Its action is believed to control the conversion of liver glycogen back to glucose to aid in maintaining normal blood-sugar levels [3]

[3] Korp, W., and LeComptel, P M: Diabetes 4 347, 1955

Insulin Deficiency. When disease interferes with regular production of insulin, the control of the blood-sugar [illegible]

and, since it is excess material, some means for disposing of it must be found. When it reaches the level of 160 to 180 mg. per 100 cc of blood, known as the renal threshold, glucose is excreted by the kidneys and appears in the urine.

Mechanisms of Carbohydrate Metabolism. The mechanisms by which the body attempts to control the carbohydrate metabolism may be likened to a great mountain stream controlled by dams and reservoirs. The first dam is probably the insulin, which, through its control, causes the reservoir—the liver—to be filled with glycogen When, for any reason, this reservoir is broken down, the stream below is flooded, and the second dam—the kidneys—attempts to hold it in check. When it reaches a certain level there, it again overflows and in all probability will spread to the fields beyond, which, according to the simile, represent the tissues of the body As the fields require moisture, so do the tissues require glucose, but an overabundance or flooding in either case may be detrimental

The kidneys are also the sluiceway which eventually allows for an overflow into the urine when the flood level of sugar reaches the critical level. The original source of the sugar as it appears in both the blood and the urine is, as stated, the food supply Of course, it comes chiefly from the carbohydrates—starch and the various sugars, but it is interesting to know that each of the other food constituents—protein and fat [illegible] pass through to the tissues if needed for

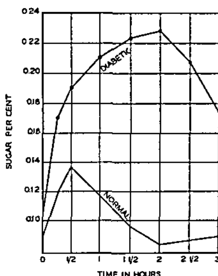


Fig 70. Glucose tolerance curve in the case of a normal and a diabetic individual Ordinates = per cent sugar, abscissa = time after the ingestion of 100 Gm of glucose. (Bodansky Introduction to Physiological Chemistry, New York, Wiley)

diabetes mellitus, although there are a few exceptions. These include renal glycosuria, when the renal threshold for glucose is lowered, alimentary glycosuria, when too much sugar has been ingested at one time for the liver to store the excess, pentosuria, when the body fails to oxidize a certain carbohydrate called pentose, fructosuria, when fructose is not utilized, and lactosuria in nursing mothers, when lactose is produced in excess quantity. For more specific details concerning the tests when diabetes mellitus is suspected, see Special Tests, Part Four.

Ketone Bodies in the Urine

Certain substances may appear in the urine as the result of incomplete burning of the fats. The presence of these substances, known as ketone bodies, is indicative of a serious condition called ketosis, or diabetic acidosis, which, if not corrected, may result in coma.

Blood-Sugar Test

Although the presence of glucose in the urine is strongly suggestive of diabetes mellitus, a blood-sugar examination is necessary to make the diagnosis certain. This test is made after a 12-hour fast; in diabetes it will show a much higher level of blood sugar than the normal level of 70 to 100 mg. per 100 cc. of blood. When this test is not conclusive, a glucose tolerance test on the blood should be made. The latter test is carried out by giving a known amount of glucose in proportion to the body weight after a 12-hour fast The blood

test at hourly intervals for as much as 6 hours Note the difference in the glucose tolerance curve between a normal person and a diabetic (Fig. 70)

Dietary Tests

Testing the Carbohydrate Tolerance

The capacity for burning glucose is known as the patient's carbohydrate tolerance. It is the difference between the glucose equivalent of the diet and the glucose excreted in the urine To determine this in a patient without ketosis, a calculated weighed diet of known composition, usually low in both carbohydrate and calories, is given, following which analyses are made for several days If the urine becomes sugar free, it indicates that the patient may be able to burn more carbohydrate, and another diet with increased carbohydrate and calories is tried. This diet is continued or increased cautiously unless sugar again appears, when it is evident that the patient's tolerance has been exceeded, and in all probability his stand-

and, because two of the three ketones are acids, upset the acid-base balance, hence the name acidosis or ketosis They are excreted in the urine with the excess sugar. One of them—acetone—is volatile. It may escape from the blood in the lungs and appear on the breath, giving a typical "ripe pear" odor.

DIET THERAPY

General Discussion. As can be seen from the foregoing paragraphs, the treatment of diabetes is by diet and, if necessary, insulin. However, today there is a sharp difference of opinion over the degree of dietary restriction. The controversy is over the effect of blood-sugar levels on the eventual health of the patient. Diabetics are more susceptible than others to the pathologic changes in the blood vessels known as atherosclerosis Not only does this occur more frequently in diabetics than in nondiabetics, but it occurs in younger age groups There is little question that in general the duration of the diabetes is the most significant factor in the onset of blood-vessel changes, although it must be noted that some diabetics have marked damage soon after the onset of diabetes, while Joslin[4] cites 23 diabetics who have had the disease for 25 years or more without any demonstrable blood-vessel change

Chemical Method of Regulation. The conservative group of physicians[5] believes that blood-sugar levels higher than normal, resulting in the presence of sugar in the urine, contribute to the [illegible]

is known as the chemical method of regulation of diabetes

Clinical Control of Diabetes Dietary restrictions are difficult to maintain indefinitely, and patients again and again "break their diet." With our increased understanding of the role of food to satisfy emotional as well as physiologic needs, some physicians have come to reassess the need for very carefully restricted diets and have allowed their patients a so-called "free" diet. [illegible]

and maintains his weight (or gains or loses weight as necessary) The larger part of the diet is assured of metabolism by a prescribed dose of insulin The patient is allowed to spill excess sugar into the urine if he has eaten more carbohydrate than he can use. These physicians[6] claim that there is no indication that such patients have more extensive atherosclerotic changes than those kept on a strictly controlled diet, and that the less-restricted diet enables the patient to live a more nearly normal life This method is called the clinical regulation of diabetes

Moderate Method of Dietary Control. In between these two schools of thought are those[7] who are of the opinion that a liberal but not a "free" diet, with moderate control of the blood-sugar levels and glycosuria, is the most desirable method of treating both the disease and the patient Mosenthal[8] believes that it may be of advantage to assess the personality of the patient and suit the diet more nearly to his ability to follow it. Thus a new diabetic may do best on a carefully controlled diet until he feels secure with his disease, after which the

[4] Joslin, E P J.A.M.A 147 209, 1951, Keiding, N R, *et al* J.A.M.A. 150 964, 1952, Ricketts, H T. J.A.M.A 150 959, 1952.

[5] *Ibid.*

[6] Dolger, H J.A.M.A 134 1289, 1947, Tolstoi, E Am J Nursing 50 652, 1950

[7] Mosenthal, H. O Ann Int. Med 29·79, 1948

[8] *Ibid.*

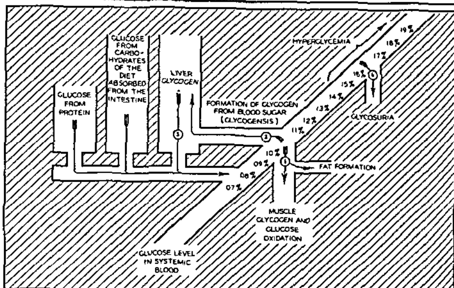


Fig 71 Schematic illustration of some of the factors which regulate the sugar concentration of the blood (1) and (2) under control of insulin and other hormones; (3) *under control of sympathetic nervous system and Adrenalin;* (4) *regulated* by renal threshold (Bodansky: Introduction to Physiological Chemistry, New York, Wiley. After Ringer and Baumann, with modifications Barker, L. F.: Endocrinology and Metabolism, New York, Appleton-Century)

repair or growth If not in demand for immediate use, they are deaminized, as stated in Chapter 4 The nitrogenous portion is eliminated, while the glucose portion of the remainder is stored like any other carbohydrate. While there is some difference in the various kinds of protein as to the percentage of glucose which each yields, the average is 58 per cent of the total weight of protein

Likewise, when the fats are metabolized, fatty acids and glycerol are

used Theoretically at least, all fats yield about 10 per cent glucose

There are, therefore, three sources of glucose from which blood sugar may be derived.

	Per Cent
Carbohydrates	100
Protein	58
Fats	10

The total glucose in a day's diet may be expressed by the following formula $G = 100\% C + 58\% P + 10\% F$.

During fasting or starvation or an *insufficient food supply, the body protein* and fat serve as sources of carbohydrate, though in insufficient amounts to constitute a normal supply.

How Ketone Bodies Get Into the Blood and the Urine

Fats, after digestion, find their way into the blood largely via the lymphatic system (*see* Chap 9). In the process of oxidation in the cell, ketones are formed and then are further oxidized to carbon dioxide and water. In untreated diabetes, when the patient is not metabolizing sufficient glucose and must depend on increased fat oxidation for his energy, ketones tend to pile up because they are produced in much greater quantity. They enter the blood stream

afternoon and ⅖ each for lunch and dinner If only 3 meals are ordered, using this type of insulin the carbohydrate may be distributed so as to allow ⅙ for [illegible]

[illegible]

Diets. Although there may be some differences of opinion as to the principles just outlined, there is general agreement that the following are important factors in the dietary treatment of diabetes mellitus

1. The caloric intake should allow the patient to lose or to gain weight as necessary until he reaches his average or slightly below average weight for his sex, height and build, after which it should be such as to maintain this weight.

2. Protein should be normal, 1 to 1½ Gm per Kg of body weight.

3. Carbohydrates may be somewhat restricted.

4 Fats are used to make up the "balance" of the total calories required Fat never must be in sufficient quantity to produce ketosis.

5. The diet must be adequate in all essential nutrients.

The restrictions of this diet are more in relation to the quantities allowed than to the variety.

Diabetic Diet

Foods Allowed.	
Milk	Fresh, dried or canned (unsweetened), buttermilk, skim milk
Cheese	All
Fats	All
Eggs	All
Meats, fish and fowl	All
Soups	Broths and clear soups
Bread, cereals, Italian pastes	All
Vegetables	All, fresh, canned or frozen, including potatoes, cooked or as salad
Fruits	All fresh or canned without sugar
Desserts	Fruits as above; custards and gelatins made without [illegible]
Beverages	[illegible]
Condiment	[illegible]
Foods To Be Avoided or Used Sparingly:	
Sugar	All forms, including candy, chewing gum, honey, syrups and molasses, jellies, jams and preserves, fruit canned with sugar
Fruits	[illegible]

[illegible]

Note Also all foods of unknown composition.

dietary restrictions may be relaxed somewhat.

Dietary Prescriptions

The dietary prescription should be based on the nutritional needs of the patient. A mild case of diabetes, especially if the patient is overweight, may be controlled by diet alone, whereas the more severe diabetic will require insulin in order to maintain a good nutritional state.

The requirements for calories are the same as for normal individuals of the same sex, height, build and activity Many normal people, however, consume a larger quantity of food than is actually required for the maintenance of health and bodily activity. The diabetic is cautioned not to exceed the actual requirements. Indeed, it is usually thought best for him to maintain himself at slightly below the average weight (*see* Table 10, Part Four). The energy requirements have been discussed in Chapter 5. Exercise is considered to be of therapeutic value because it lowers the blood sugar *and, therefore, lessens the amount of insulin* needed.

The energy requirement for a middle-aged man of average size doing sedentary work is from 2,200 to 2,500 calories, while a woman under the same conditions will require from 1,800 to 2,000 calories. The usual prescription for diabetics calls for 30 calories per Kg (2 2 lbs.) of normal body weight.

Ratio of Protein, Fat and Carbohydrate in the Diet. It will be remembered that for an adult the daily protein requirement is from 58 to 70 Gm. of

tabolism of protein than from carbohydrate, and it has a high satiety value

There is some difference of opinion among physicians as to the optimum ratio of carbohydrate to fat in the diet. Two grams of carbohydrate to one each of fat and protein are frequently prescribed. However, in young adolescents and in physically active adults, the proportion of carbohydrate may be some*what higher, with enough insulin pre*scribed to ensure metabolism.

The distribution of the carbohydrate in the day's diet is quite as important as the total quantity consumed. For patients who do not require insulin, the total carbohydrate is divided equally for the 3 meals. Since the blood sugar is usually at its height during the morning hours, some doctors advise a lower carbohydrate at breakfast, about ⅕ of the day's allowance, with ⅖ at noon and ⅖ at night, even for patients not requiring insulin.

Today the use of regular insulin in diabetes is limited largely to patients undergoing surgery or ill with an infection It may be given in conjunction with one of the slow-acting insulins, in which case the distribution of carbohydrate should follow the latter's pattern.

The slow-acting insulins are used most commonly today because only 1 dose

ing the night or the early morning, when the slow-acting insulin may still be functioning and the carbohydrate of the supper meal has been metabolized.

When protamine zinc insulin is used, the carbohydrate is most commonly divided into ⅕ for breakfast and ⅖ each at lunch and dinner, after the carbohydrate for the evening feeding has been deducted. With NPH and Lente insulins, which act slightly less slowly, the carbohydrate may be divided into thirds, or it may be given ⅕ at breakfast and ⅖ each at lunch and dinner after the evening feeding is deducted.

Globin insulin, also slow acting, may require 4 meals a day, dividing the carbohydrate ⅙ each for breakfast and mid-

basic dietary pattern (*see* Chap. 18), and they should be planned so far as possible around the family menus, or, perhaps better still, the family's meals should be planned around the patient's diet

The doctor's dietary prescription is given in terms of the number of grams of protein, fat and carbohydrate This necessitates the careful calculation in terms of foods allowed and the weighing of the diet, at least at the beginning For example, the prescription may be as follows

Protein	90 Gm.
Fat	100 Gm.
Carbohydrate	200 Gm.

To calculate such a diet, the quantities of the essential foods needed for adequate nutrition are listed and their food composition recorded Additional foods are then added until the total composi-

distribute the carbohydrate in accordance with the type of insulin prescribed.

Tables of food values must be consulted carefully Table 1 in Part Four

useful

Variations in Food Composition. It must always be remembered that all tables of food values are based upon

carbohydrate intervals Some physicians allow the patient to eat freely of all 3 per cent vegetables and do not begin to count the carbohydrate until the 6 per cent grouping (*See* Table 3 in Part Four)

There is probably more variation in cuts of meat than in vegetables Fat is the factor of variance In order to prevent any gross error, only lean meats should be served, unless the fat value is quite stable, as in bacon The shrinkage of meats, owing to cooking, introduces another variable, hence, in using tables of food values, care should be taken to note whether they are based upon raw or cooked weight.

portion of water used and in the evaporation. It is well to prepare individual portions of cooked cereals, although care must be taken to use a double boiler or in some way prevent loss of material adhering to the container A typical diabetic diet is shown on the previous page

Meal Planning and Exchange Lists A more liberal yet moderately accurate method for choosing a diabetic diet was prepared in 1950 by the American Dietetic Association and approved by the American Diabetes Association and the United States Public Health Service The result is the booklet *Meal Planning with Exchange Lists*[10] In it, foods having a more or less common composition are grouped together in such quantities that one food can be exchanged for another in each group. The patient is allowed to choose the permitted number of servings in each group according to his preference. The exchange lists are reproduced on pages 282 to 284, and recipes based on exchanges will be found in Chapter 50. The original booklet contains a good deal of additional explanatory material.

[9] Watt, B K., and Merrill, A L., U S Dept. of Agriculture, Agriculture Handbook No 8, 1950

[10] Obtainable from The American Dietetic Association, 620 N. Michigan Ave., Chicago 11, Ill

SAMPLE DIABETIC DIET*

Prescription Protein, 90 Gm., Fat, 100 Gm.; Carbohydrate, 200 Gm.

Meals	Food Items	Amount Allowed		Protein	Fat	Carbo-hydrate	Calories
Breakfast			Gm.	Gm.	Gm.	Gm.	
	Cantaloupe†	½	200	2		10	40
	Egg	1	54	6	6		77
	Toast	1 slice	23	2	1	12	63
	Butter or margarine‡	1 teaspoon	5		4	.	36
	Milk	1 c	244	9	10	12	166
	Coffee					..	
	Light cream	2 tablespoons	30	1	6	1	60
				20	27	35	442
Dinner							
	Tomato juice	1 glass	200	2	.	8	42
	Roast beef	3 medium slices	75	18	18		240
	Brussels sprouts†	1 serving	100	4	1	10	47
	Potato	1 medium	100	2		19	83
	Bread	2 slices	46	4	2	24	126
	Butter or margarine‡	2 teaspoons	10		8	.	72
	Grapefruit†	½	100	1		10	40
	Coffee or tea						.
	Light cream	2 tablespoons	30	1	6	1	60
				32	35	72	710
Supper							
	Broth				.	.	.
	Roast chicken	2 slices	45	9	6		90
	Peas†	1 serving	100	5	.	12	70
	Summer squash†	1 serving	100	1		4	16
	Lettuce and tomato†	1 serving	100	1		4	20
	French dressing	½ tablespoon	8		3	1	31
	Bread	2 slices	46	4	2	24	126
	Butter or margarine‡	2 teaspoons	10		8		72
	Milk	1 c.	244	9	10	12	166
	Cherries, whole†	1 c	100	1	1	15	61
				30	30	72	652
Bedtime feeding	Milk	1 c.	244	9	10	12	166
	Crackers	2 small	11	1	1	7	40
				10	11	19	206
		Day's Totals		92	103	198	2,010

* ... Table 1, Part Four

... l for the day

Planning and Calculating the Diet

Chemically Controlled Diabetes. The patient must be helped to realize that his health and usefulness to society depend upon his strict attention to his diet, although for psychological reasons he must not be made to feel that he is different and that he does not share in the family life. His meals must be built around the essentials, as described in the

A series of nine meal plans[11] are also available, ranging from 1,200 to 3,000 calories, and of varying carbohydrate, protein and fat content. These are intended for use by the physician in prescribing for a particular patient. An example of one of these, Meal Plan No 4, contains 90 Gm. protein, 100 Gm. fat, 220 Gm. carbohydrate and 2,200 calories. The food allowance and the meal plan for the day plus two suggested menus are reproduced on pages 286 and 287.

Free or Nonrestricted Diabetic Diets. As has already been stated, there is a school of diabetic specialists today who believe that no harm is done if the patient spills sugar so long as he maintains his normal weight, shows no ketone bodies in the urine and has none of the classic symptoms of diabetes such as increased thirst, increased urination and weight loss. Accordingly, the patient is allowed to eat an ordinary diet, including desserts and other carbohydrate rich

foodstuffs high in concentrated sweets to some extent but do not require the patient to follow a strict regimen. Insulin is given once a day. These physicians argue that so long as weight is maintained and no ketones are formed in excess, the patient is metabolizing enough carbohydrate and other foods for his energy needs The remainder of the carbohydrate which is not metabolized and spills into the urine is considered as waste matter and not neces-

[11] Meal Plans 1 to 9, The American Dietetic Association, 620 N. Michigan Ave, Chicago 11, Ill.

MEAL PLANNING WITH EXCHANGE LISTS FOR THE DIABETIC

(Adapted from Meal Planning with Exchange Lists, The American Dietetic Association, 620 N. Michigan Ave, Chicago 11, Ill)

Foods That Need Not Be Measured

(Insignificant carbohydrate or calories)

Coffee	Gelatin (unsweetened)	Saccharin and other noncaloric sweeteners
Tea	Rennet tablets	Pepper and other spices
Clear broth	Cranberries (unsweetened)	Vinegar
Bouillon (fat free)	Mustard (dry)	Seasonings
Lemon	Pickle (unsweetened)	

List 1. Milk Exchanges

One exchange of milk contains 8 Gm protein, 10 Gm. fat, 12 Gm. carbohydrate and 170 calories

This list shows the different types of milk to use for one exchange.

Type of Milk	Amount To Use	Type of Milk	Amount To Use
Whole milk (plain or homogenized)	1 c	†Powdered skim milk (nonfat dried milk)	¼ c.
*Skim milk	1 c	Buttermilk (made from whole milk)	1 c.
Evaporated milk	½ c.	†Buttermilk (made from skim milk)	1 c.
Powdered whole milk	¼ c.		

You can use one type of milk instead of another. For example, you may use ½ cup

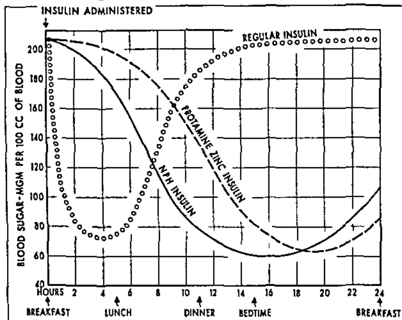


Fig 72 Graphic representation of the effects of comparable doses of various insulins on the blood-sugar level of a diabetic patient Note the longer-lasting action of NPH insulin as compared with regular insulin and protamine zinc insulin (Adapted from a chart and used by permission of Eli Lilly and Company)

sarily contributory to the development of degenerative disease The great advantage of this regimen is that the patient is not continually aware of his re-

INSULIN THERAPY

Insulin, as already stated, is the internal secretion of the pancreas, produced by the islands of Langerhans The discovery that insulin could be isolated from the pancreas of an animal, the development and the technic of its administration, and the development of commercial standards for its production together form one of the greatest contributions of the century to medical science Insulin is sold on the basis of its unit content, the commercial unit used being the same as that originally designed in the experimental laboratory. An insulin unit is ⅓ the quantity which will cause a 2-Kg. (4 4 lb.) rabbit to reach the blood-sugar level of 45 mg per 100 cc of blood—the convulsive level—within 5 hours. In the human being it will cause one or more grams of carbohydrate to be oxidized—usually 1½ to 2 Gm.—but this varies with the patient and his condition Insulin is sold

ments for carbohydrate

It is true that exercise increases the demand for and ability to burn carbo-

List 4. Bread Exchanges

One exchange contains 2 Gm. protein, 15 Gm carbohydrate and 70 calories.

This list shows the different amounts of foods to use for one bread exchange:

	Amount To Use		Amount To Use
Bread	1 slice	Vegetables	
Biscuit, roll (2" diam.)	1	Beans and peas, dried, cooked (Lima, navy, split pea, cowpeas, etc)	½ c.
Muffin (2" diam.)	1		
Cornbread (1½" cube)	1		
Cereals, cooked	½ c.	*Baked beans, no pork*	¼ c.
Dry, flake and puff types	¾ c.	Corn	⅓ c.
Rice, grits, cooked	½ c.	Popcorn	1 c
Spaghetti, noodles, cooked	½ c.	Parsnips	⅔ c.
Macaroni, etc., cooked	½ c.	Potatoes, white	1 small
Crackers, graham (2½" sq)	2	Potatoes, white, mashed	½ c.
Oyster (½ c)	20	Potatoes, sweet, or yams	¼ c
Saltines (2" sq)	5	Sponge cake, plain (1½" cube)	1
Soda (2½" sq.)	3	Ice cream (Omit 2 fat exchanges)	½ c.
Round, thin (1½")	6		
Flour	2½ tbsp		

Use these foods carefully because they have a lot of sugar.

List 5. Meat Exchanges

One meat exchange contains 7 Gm protein, 5 Gm fat and 75 calories.

This list shows the different amounts of foods to use for one meat exchange.

	Amount To Use		Amount To Use
Meat and poultry (medium fat)	1 oz.	Egg	1
beef, lamb, pork, liver, chicken, etc		Fish: haddock, etc.	1 oz
		Salmon, tuna, crab, lobster	¼ c.
		Shrimp, clams, oysters, etc	5 small
Cold cuts (4½" x ⅛")	*1 slice*	*Sardines*	*3 medium*
salami, minced ham, bologna, liverwurst, luncheon loaf		Cheese: Cheddar type	1 oz
		Cottage	¼ c.
Frankfurter (8-9 per lb)	1	*Peanut butter	2 tbsp.

* Limit peanut butter to 1 exchange a day unless the carbohydrate in it is allowed for you in your meal plan.

List 6. Fat Exchanges

One fat exchange contains 5 Gm fat and 45 calories

This list shows the different foods to use for one fat exchange·

	Amount To Use		Amount To Use
Butter or margarine	1 tsp.	French dressing	1 tbsp.
Bacon, crisp	1 slice	Mayonnaise	1 tsp.
Cream, light	2 tbsp	Oil or cooking fat	1 tsp.
Cream, heavy	1 tbsp.	Nuts	6 small
Cream cheese	1 tbsp.	Olives	5 small
Avocado (4" diam.)	⅛		

Note: *See* Chapter 50 for recipes based on exchange allowances.

SAMPLE MENUS

(These menus show some of the ways exchange lists can be used to vary the meal plan Recipes will be found in Chap 50)

Breakfast

Orange juice—½ c.
Eggs—2
Toast—2 slices
Butter—3 tsp.
Coffee—2 tbsp evaporated milk*

Lunch or Supper

Ham and cheese sandwich (cheese—1 oz, ham—1 oz, bread—3 slices, butter—1 tsp.)
Lettuce and tomato salad
Mayonnaise—1 tsp
Apple—1 small
Milk—1 cup (8 ozs)
Coffee or tea

Dinner

Hamburg patties—3 ozs.
Mashed potato—½ c.
Carrots—½ c Spinach
Bread—2 slices
Butter—3 tsp.
Banana—1 small
Coffee or tea

Bedtime

Milk—¾ c. (6 ozs.)*
Peanut butter sandwich (peanut butter—2 tbsp, bread—2 slices)

* 2 tbsp. evaporated milk equals ¼ cup whole milk. Part of the milk is taken from bedtime to use at breakfast

Breakfast

Prunes—2 medium
Cereal, cooked—½ c.
Milk—¼ c. (2 ozs)†
Poached eggs (2) on toast—1 slice
Butter—2 tsp.
Coffee—2 tbsp. light cream

Lunch or Supper

Bologna—2 slices
Radishes, celery, sour pickles
Potato salad (B)—1 c. (recipe Chap 50)
Bread—1 slice Butter—1 tsp
Grapefruit—½
Milk—1 cup (8 ozs)
Coffee or tea

Dinner

Tomato juice—small glass
Roast lamb—3 ozs
Steamed rice—1 c.
Green peas—½ c.
Mixed green salad
French dressing—1 tbsp
Bread—1 slice Butter—2 tsp
Fruit gelatin II (recipe Chap. 50)
Coffee or tea

Bedtime

Milk—¾ c. (6 ozs)†
Graham crackers—4
American cheese—1 oz.

† Part of the milk is taken from bedtime to use at breakfast.

protamine zinc insulin ½ hour before breakfast, and usually it is given only once a day. The distribution of carbohydrate intake may be different from what it is when regular or crystalline zinc insulin is used, as already stated

Because it absorbs slowly, the single morning dose may not be sufficient to control the early-morning glycosuria of a severe diabetic However, this may be overcome by the combined use of the regular and the protamine zinc insulins By its use, the number of injections has been reduced from as many as 4 per day to 1 or 2, in many cases fewer units are required. Ketosis is almost completely overcome by its use.

NPH and Lente Insulins

More recent members of the insulin family are NPH and Lente insulins. These two insulins resemble in their action a combination of regular and *protamine* insulins Each takes effect more quickly and is longer lasting, although there are less likely to be late reactions, as with unmodified protamine insulin. (*See* Fig 72) The dosage may be slightly less than for unmodified protamine zinc insulin.

ADA MEAL PLAN NO. 4

For____________________

Use only as your doctor prescribes Carbohydrate 220 Gm , protein 90 Gm., fat 100 Gm · calories 2,200.

This meal plan has been prepared for use with the Meal Planning Booklet.

YOUR FOOD FOR THE DAY

AMOUNT	KIND OF FOOD	CHOOSE FROM
1 pint	Milk	List 1
Any amt.	Vegetable Exch A	List 2A
1	Vegetable Exch. B	List 2B
4	Fruit Exchanges	List 3
10	Bread Exchanges	List 4
8	Meat Exchanges	List 5
8	Fat Exchanges	List 6

Divide this food as follows:

YOUR MEAL PLAN

Breakfast

1 Fruit Exchange from List 3
2 Meat Exchanges from List 5
2 Bread Exchanges from List 4
3 Fat Exchanges from List 6
Coffee or tea (any amount)

Lunch or Supper

2 Meat Exchanges from List 5
3 Bread Exchanges from List 4
Vegetable from List 2A (any amount)
1 Fruit Exchange from List 3
2 Fat Exchanges from List 6
1 cup milk from List 1*
Coffee or tea (any amount)

Dinner or Main Meal

3 Meat Exchanges from List 5
3 Bread Exchanges from List 4
Vegetable from List 2A (any amount)
1 Vegetable Exchange from List 2B
2 Fruit Exchanges from List 3
3 Fat Exchanges from List 6
Coffee or tea (any amount)

Bedtime

1 cup milk from List 1*
2 Bread Exchanges from List 4
1 Meat Exchange from List 5

* Part of milk may be used for coffee or tea or for cereal.

hydrate. Other factors, such as strong emotion, worry or overwork, may also affect the insulin requirement These may have the effect of raising the blood sugar and thereby disturbing the patient's carbohydrate balance.

The first insulin developed is now known as unmodified or regular insulin in contrast with modified forms of it known as crystalline zinc, protamine zinc, NPH, Lente and globin insulins described below.

Crystalline Zinc Insulin

[illegible]

[illegible] inasmuch as it has a lower protein content. Crystalline insulin is supposed to give fewer allergic reactions, otherwise, the action of this product is very similar to that of the regular, or unmodified, insulin. Both act quickly and are effective for approximately 6 to 8 hours.

Protamine Zinc Insulin

Protamine zinc insulin was made available through the research of Hagedorn, of Denmark, and others. It is a precipitate of the regular, or unmodified, insulin and a protamine which originally was obtained from the sperm of fish. Zinc in minute quantities is added to enhance the effect of the protamine. This type of insulin is absorbed much more slowly than the original preparation produced by Banting or the crystalline zinc insulin described above. Its effect may last for a day or more, depending upon the individual, and the drop in blood sugar is more gradual For this reason, it is advisable to give the



Fig 73 Both the patient and his wife are learning about the administration of insulin. (The New York Hospital)

Globin Insulin

Globin insulin is a combination of an aqueous solution of insulin with the addition of the protein globin derived from hemoglobin of beef blood This product also contains zinc chloride and is a clear solution Its action is intermediate, between the regular and the protamine insulins Its effect is apparent after about 2 hours and reaches its maximum in about 8 hours, when it begins to wane, gradually decreasing for another 8 hours Its effect, therefore, is continuous for approximately 16 hours. When given before breakfast, the peak of its activity is reached about midafternoon. For this reason, some of the more severe diabetics find it necessary to have a midafternoon feeding.

Insulin Administration

The quantity of insulin prescribed may vary from 10 to 80 or more units Usually it is given ½ hour before break-

vessel changes.[14] Thus, although much has been gained in lifespan for the young diabetic, much remains to be done

The cause of the blood-vessel changes is much debated, as discussed earlier in the chapter. The physicians who advocate close chemical control of diabetes believe that such control may forestall the complications as long as possible, although they admit that they will eventually occur. They recommend that diabetic children and their parents be

Planning and Exchange Lists (*see* pp. 282-284) after an initial period of weighing[15] Other physicians allow children to share family meals, perhaps limiting sweets to some extent, and giving

be made with less emotional conflict

Whatever the school of thought in regard to control of the diet, all physicians agree that the nutritional needs of the diabetic child are the same as those of the nondiabetic (*see* Chaps 13 and 14) If there has been any marked weight loss before the disease is discovered, the diet prescribed should be such as to allow the child to recover this loss. As he grows and develops, there must be periodic readjustment of the diet Strenuous physical activity may be compensated for by small amounts of food before the exercise

Particularly in the adolescent years, when girls and boys grow very rapidly, it is essential that the diet keep pace with the nutritional needs, and that in-

ments which will be necessary over the years

DIABETES IN PREGNANCY

Diabetes in the mother has always been a special hazard in pregnancy. There is increased fetal loss in the course of the pregnancy as well as an increased loss of infants carried to term as compared with the nondiabetic patient. In the past few years, however, by closely following the mother, obstetricians have been able to secure a far greater number of successful pregnancies than formerly.[16]

Again there is difference of opinion about the type of dietary control, but all physicians agree that the nutritional needs of pregnancy must be adequately met (*see* Chap. 12), with sufficient insulin to cover the increased food intake.

TEACHING THE PATIENT

The education of the patient is an important aspect of his treatment He should be taught at his own level of

principles involved in the treatment of his disease and be helped to make the necessary adjustments in his mode of living

2. Whatever dietary regimen is prescribed, the patient should be taught

[14] Marble, A J Am Dietet. A. 33 569, 1957

[15] Jackson, R L., and Beckett, S W. J. Am Dietet. A. 32 528, 1956.

[16] Stephens, J. W., *et al.*: J.A.M.A. 161: 224, 1956.

and insulin, with some source of carbohydrate, such as orange juice, and any other such procedures as the physician may prescribe.

Insulin Reactions

Insulin reactions occur when too much insulin is given, when the patient does not eat all of his prescribed diet, or when he indulges in excessive exercise before a meal.

nausea, dizziness and double vision, and eventually stupor The treatment when the condition is discovered is the immediate administration of sugar in some form, either as one of the fruit juices or as sugar and water if the former is not easily available This should be followed by a more slowly absorbed food mixture such as crackers or toast and milk, which will continue to feed carbohydrate into the system. It may be necessary to repeat both the rapidly and the slowly absorbed feedings for some time until all danger of insulin reaction is past.

With unmodified insulin, the onset of an insulin reaction is rapid and more dramatic The patient may complain of nervousness and hunger, perspire profusely and become inarticulate. If untreated, stupor will result here also. *Immediate administration* of rapidly absorbed carbohydrate such as fruit juices or sugar in other forms is effective.

The danger of insulin reaction is that permanent brain damage may result, especially if the reactions are frequent, or if it is severe and extended so that the

especially of the slow-acting insulins, so that she may report danger signs immediately. Patients taking insulin are advised to carry 2 lumps of sugar or hard candy for such emergencies.

Surgery

Diabetics can now be operated upon with a comparative degree of safety. In emergencies, as in acute, operable infections, there need be no delay in operating. In these cases, the patient is given insulin and intravenous fluids and glucose When there is time to pre-

of sugar and seeing that his glycogen, fluid and salt reserves are adequate. A weighed diet accompanied by the use of insulin may be used in such cases.

On the morning of operation both breakfast and insulin are withheld. *Occasionally, a small dose of insulin is injected* before the patient goes to the operating room.

After the operation, glucose and fluids are given intravenously with sufficient insulin to metabolize the glucose Oral feeding is started as early as possible, usually in 24 hours At first fruit juices, ginger ale, tea and broth are given. Later a more liberal diet is resumed.

DIABETES IN CHILDREN

The outlook for children who develop diabetes has changed markedly from the preinsulin days, when the disease invariably was fatal Recently White[13] has shown that of 1,072 patients whose onset of diabetes occurred before the age of 15 and who had had the disease 20 years or more, 879 were living at the time of the study. Of the 879 patients, *71 per cent had had diabetes from* 20 to 29 years, 24 per cent had had diabetes from 30 to 34 years, and 5 per cent had had the disease for more than 35 years. However, in a large percentage of such patients, complications develop after 15 to 20 years or more of diabetes. These include diminished vision and heart and kidney disease, all attributable to blood-

[13] White, P.: Diabetes 5 445, 1956.

nose diabetes? Describe the tests and

pened to his metabolism to bring about these two conditions? What will the treatment possibly be?

5 What percentage of carbohydrate is metabolized as glucose in the body? Of protein? Of fat? How much glucose will the body obtain from the Pattern Dietary which contains 90 Gm of protein, 100 Gm. of fat and 200 Gm of carbohydrate?

6. A diabetic patient weighs 120 lbs His ideal weight is 125 lbs How many calories should he have per day? How much protein?

7 The carbohydrate allowance for a diabetic patient is 150 Gm He is being given protamine zinc insulin. How will the carbohydrate of his diet probably be divided for the day?

8 Plan a diabetic diet with the following diet order protein 75, fat 110, carbohydrate 200, carbohydrate divided for NPH insulin The patient is a man with a large appetite. Use Table 1, Part Four, for food composition figures Repeat, using the Exchange Lists in this chapter. Are the two diets very different?

9. What is meant by a 15 per cent fruit? A 6 per cent vegetable?

10 Which foods are permitted for use on a diabetic diet? Which should be avoided? Give 5 substitutions that a diabetic can make for a slice of bread.

11. What is meant by the chemical regulation of diabetes? The clinical regulation? Why is there controversy over these two methods of regulation?

12. What is meant by a "free" diabetic diet? What advantages are claimed for it?

13 Which foods should be included in the diabetic diet to make it nutritionally adequate?

14 What is insulin? How many types of insulin are there? How do they differ?

15 List the symptoms of insulin reaction due to one of the slow-acting insulins Why should a rapidly absorbed carbohydrate be followed by a more slowly absorbed meal in treating this type of insulin reaction? List the foods that should be used

16. What is a diabetic ketosis? What causes this condition? How is it treated?

17. How are diabetics prepared to undergo surgery?

18 What differences are there between the treatment of diabetic children and diabetic adults?

19 What precautions should be taken by a diabetic patient who is pregnant?

20. A diabetic patient is to be discharged What should he have been taught by the time he is ready to go home? What is the nurse's responsibility in teaching diabetic patients?

See Bibliography in Part Four for other pertinent material on the topics discussed in this chapter.

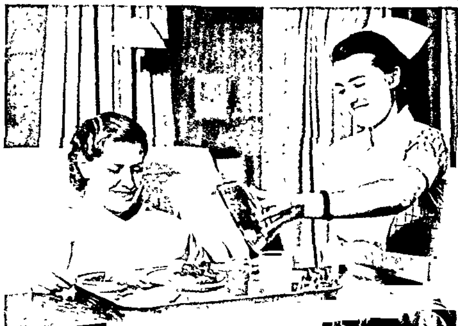


Fig 74. The nurse's responsibility for support and for teaching never ceases. Here the patient is surprised and pleased at the amounts and variety of foods allowed on her diabetic diet. (The New York Hospital)

that the foods served on his trays in the hospital illustrate his diet order He should learn to evaluate what is served and be instructed as to what substitutions he can make for the foods served

3. He should be warned against overweight and overeating

4. He should be taught that although moderate exercise is beneficial for diabetics, as for others, strenuous activity may give rise to imbalances between his diet and insulin, and should be avoided.

5 He should learn to test his urine for sugar and for acetone if the doctor orders it. Directions for tests will be found in Part Four or in any of the diabetic manuals mentioned in the list of references under Diabetes.

6. On the advice of the physician he must be taught to administer his own [illegible] (D[illegible] in Part Four.)

taught their symptoms and prevention.

8 He must be taught the value of good hygiene, particularly of the feet, and the need of regular meals, sufficient sleep and avoidance of excesses of any kind

Prognosis. *It must be remembered* that a diabetic patient is never "cured" in the sense of no longer having to consider his diet Insulin, wonderful as it is, does not cure—it merely aids, nevertheless, it enables the patient to live comfortably and to engage in life's activities, as well as having his life expectancy greatly lengthened by its use

STUDY QUESTIONS

1. What are thought to be some of the predisposing causes of diabetes?

2. What symptoms does a patient with diabetes have? Why does he show each one of these symptoms?

3. What tests are performed to diag-

denum the food mass is further mixed with bile and the pancreatic enzymes, and digestion begins in earnest. The digested food materials are absorbed into the body all along the small intestine, and the residue, when it enters the colon, is largely water and waste matter The main function of the colon is to absorb water, forming the waste into a solid mass. It used to be thought that patients could be fed with nutrient enemas, such as glucose solutions, but actually very little absorption other than water takes place at this point. For further detail on digestive processes see Chapter 9.

DIAGNOSTIC PROCEDURES

Two common procedures used in the

the gastro-intestinal tract by means of a fluoroscope and roentgenograms after a barium meal has been ingested.

Gastric Analysis

This test is carried out in the morning, before the patient has received any food A tube is passed from the mouth into the stomach, and any gastric juice present is withdrawn. The patient is then given a "test meal" consisting of 2 slices of bread and 2 glasses of water or weak tea, or he may be given 50 cc. of 7 per cent alcohol to drink. Still another procedure is the injection of histamine, a drug that is known to stimulate the production of gastric juice. The gastric contents are then withdrawn at intervals, for an hour or longer. All samples of gastric juice, including the fasting one, are examined for the presence of undigested food, bile and blood, and tested for the quantity of free and total hydrochloric acid each contains. The amount of acid present in fasting specimens and after a test meal or histamine ranges from 20 to 70 cc. N/10 hydrochloric acid per 100 cc. of gastric juice.

that no hydrochloric acid is present. It may occur in gastric disease, and is often found in patients with pernicious anemia.

Roentgenography

Roentgenography of the stomach is now a most important diagnostic procedure This may be done by x-ray photography or by direct examination with a fluoroscope By this means the

indicative of ulcer or carcinoma, and other signs of abnormalities can be studied in detail The barium meal is given in the morning, or at least 12 hours after the taking of food or drink

PEPTIC ULCER

The term *gastric ulcer* denotes an eroded lesion in the stomach, usually occurring along the lesser curvature or near the pylorus A *duodenal ulcer* is the same type of lesion, but is found in the duodenum It is much more common than a gastric ulcer Whether an ulcer occurs in the stomach or in the duodenum, the treatment is similar They will be considered together here under the term *peptic ulcer*. An ulcer is always troublesome and may endanger the life of the patient, as hemorrhage and perforation of the gastric or the duodenal wall are not an uncommon occurrence. Cancer, too, may result, more frequently from gastric ulcer.

The Pathway of Digestion
Diagnostic Procedures
Peptic Ulcer
Other Disorders of the Upper Gastro-intestinal Tract
Cardiospasm
Indigestion
Acute and Chronic Gastritis
Hiatus Hernia
Cancer of the Stomach

CHAPTER TWENTY-THREE

Diseases of the Esophagus and the Stomach

The relationship of food to the gastro-intestinal tract is an intimate one, since this organ serves as the channel of food into the body It is not surprising, therefore, that diet therapy constitutes much of the treatment in the many diseases which affect the gastro-intestinal tract.

Since food carries many emotional overtones, it is to be expected that the emotional state of the individual will *affect his digestion. Hurried meals,* meals eaten under unpleasant circumstances, and generally stressful situations all take their toll of the digestive proc-

considerable time it may develop into serious disease

Symptoms ascribed to gastric disorders may be due to pathologic conditions in other organs. It has been well said that the stomach is a mirror reflecting the ailments of the whole abdominal region, and of other parts of the body as well. Chronic appendicitis, gallbladder disease, pulmonary tuberculosis and heart disease are known to be causes of gastric distress. Likewise, many of the neuroses, and even the psychoses may give rise to gastric symptoms.

THE PATHWAY OF DIGESTION

Food passes from the mouth via the esophagus into the stomach. Here it is mixed with the constituents of the

down of food However, the stomach serves mainly as a storage organ It takes as long as 3 hours or more after a meal before the stomach is empty again During this time small amounts of food are carried into the duodenum each time the pyloric sphincter opens. This is a circular muscle at the junction of the lower end of the stomach and the beginning of the intestinal tract. In the duo-

certain easily digested fats inhibit the secretion of the hydrochloric acid. Therefore, milk, eggs, cream and olive oil are especially valuable in the treatment of peptic ulcer Meat, fish and fowl, although protein foods of excellent quality, *cannot be given in the early stages* of ulcer treatment, as they tend to stimulate the secretion of gastric juice (*see* Chap. 9).

Frequent and Small Feedings Are Important. Some dietary plans call for small hourly feedings, others, for feedings every 2 hours, or for 6 feedings per day. Food in the alimentary tract takes up the excess acid which otherwise would excite the pain so characteristic of ulcer, of course, with frequent feedings it is necessary to give small quantities of food and to plan the diet carefully to meet all nutritive requirements

A mechanically nonirritating diet is low in residue and, therefore, free of substances likely to cause an abrasion or irritation when coming in contact with the eroded surface of the ulcer Foods to be omitted are tough fibered meats,

the flow of gastric juice, such as the meat extractives found in broths, soups and gravies, tea and coffee, and all foods that might irritate the inflamed and

are prohibited for the same reason

Recently it was shown[2] that many ulcer patients tolerate a variety of spices without discomfort Certainly it is true that the judicious use of spices would make the peptic ulcer diet less monotonous. Possibly we could be less rigid about their complete omission than we are at present, without endangering the healing of the ulcer.

Diet in Acute Peptic Ulcer

For many years the Sippy diet[3] or modifications of it have been used successfully in the treatment of peptic ulcer This diet begins with frequent feedings of milk or milk and cream, usually 3 ozs

Diet in Convalescent Peptic Ulcer

As the pain subsides, soft-cooked eggs, refined cereals, custard and junket are added one by one to the above regimen Gradually other foods such as milk toast, strained cream soups and cottage or cream cheese are added or substituted Meals should remain small and frequent. If the patient continues to improve, he is placed on a 6-feeding convalescent ulcer diet (*see* pp 298-299)

Maintenance Ulcer Diet

This is the diet that the ulcer patient should follow more or less for the remainder of his life. Besides the foods listed on the convalescent ulcer diet, he may include whole-grain cereals, tender meats, fish and chicken, boiled, broiled or roasted, meat soups and gravies, raw fruits and vegetables in moderation; coffee, tea and cocoa and a moderate use of condiments.

Nutritional Adequacy. The peptic ulcer diet in the early stages tends to be low in calories, protein, minerals and vitamins, it may even lack entirely some essentials, such as ascorbic acid. It is important, therefore, that the patient progress as soon as possible to the more liberal ulcer diet, and that mineral and vitamin supplements be considered if the patient's nutritional state demands it.

The convalescent ulcer diet may be

[2] Schneider, M A., *et al.* Am J Gastroenterology 26 722, 1956

[3] Sippy, B. W.: J.A.M.A. 64 1625, 1915.

Causes of Peptic Ulcer

Many theories have been advanced about the cause of these lesions. Most patients are found to have a marked increase in acid secretion and an engorged and friable gastric or duodenal mucosa It is thought that there is a breakdown of some pin point in the mucosal wall with a resultant eating away of the surrounding tissue and the formation of a crater

It has been observed also that the development of an ulcer seems to be related to emotional stress Wolf and Wolff[1] reported their observations on the gastric mucosa in a patient with a gastric fistula They found that "emotional conflict involving anxiety, hostility and resentment was accompanied by accelerated acid secretion, hyper- [illegible]

[illegible] begins with anxiety and conflict and their associated overactivity of the stomach and ends with hemorrhage or perforation is that which is involved in the natural history of peptic ulcer in human beings"

Symptoms

[illegible]

such as sodium bicarbonate.

The diagnosis of ulcer is commonly [illegible]

[illegible] amination of the stomach contents, and the ulcer crater is often plainly visible on the roentgenogram. The pain complained of by the peptic ulcer patient when the stomach is empty is due to the action of the highly acidic gastric juice on the open lesion when no food is present to dilute and neutralize the gastric juice

Hemorrhage and Perforation. Sometimes hemorrhage is the first indication of the presence of an ulcer, or this may occur if the ulcer goes untreated. Sudden weakness and tarry stools, the latter due to the presence of blood, are the outstanding symptoms, and the patient is usually hospitalized at once. If perforation of the gastric or the duodenal wall accompanies the hemorrhage, the situation is even more serious, and the patient is subjected to surgery as soon as possible.

Treatment

Rest, both physical and mental, is *essential in all severe cases of peptic* ulcer. This may mean hospitalization or at least rest in bed for a period ranging from a few days to several weeks. Ambulatory patients may be advised to make a change of occupation if their present work requires heavy lifting or pulling.

Medication usually consists of antacids (alkalis) and antisecretory drugs intended to neutralize or inhibit the excess gastric acid and the pepsin activity

Dietary

Undoubtedly careful dietary management is the most important factor in the treatment of peptic ulcer. The characteristics of the diet include the following

1. Foods that neutralize and inhibit acidity
2. *Frequent small feedings*
3. Food that is mechanically and chemically nonirritating and nonstimulating
4. Gradual but ultimate restoration to an adequate diet

Foods that lower the gastric acidity are bland protein foods and fats The protein combines with the free acid and thus neutralizes the acidity, and

[1] Wolf, S, and Wolff, H G.: J A M A 120 670, 1942.

Foods To Be Avoided:

Fats .... All fried foods
Meats and fish .... [illegible]

[illegible]

Fruits .... All raw fruits except orange juice and ripe banana
Desserts .... Pastries, nuts, raisins, currants and candies
Beverages .... Coffee, tea, alcoholic and carbonated beverages
Condiments .... All condiments except salt

MENU FOR 6-FEEDING CONVALESCENT PEPTIC ULCER DIET

Breakfast	*Dinner*	*Supper*
Applesauce	Chicken, sliced	Cream of spinach soup
1 egg, soft cooked	Baked potato	Cottage cheese
White toast	String beans purée	White-bread toast
Butter or margarine	White bread	Butter or margarine
Milk	Butter or margarine	Milk
	Milk	
10 A.M.	**3 P.M.**	**9 P.M.**
Strained oatmeal with milk	Canned peaches	Gelatin dessert with whipped cream
Milk	White-bread toast, buttered, 1 slice	Milk
	Milk	

made adequate for the patient's nutritional needs if special heed is paid to including liberally all foods rich in required nutrients.

Bleeding Ulcers

Physicians are divided somewhat as to how best to treat a bleeding ulcer. Formerly food was withheld for from 24 to 72 hours after bleeding ceased [illegible]

[illegible] hours. If, however, the patient has no gastric distress and is hungry, feeding may be begun at once. This may be a Sippy regimen, or a modification of it; or it may be one of several diets designed especially for this condition.

Andresen's regimen[5] for bleeding peptic ulcer consists of a mixture of *gelatin, glucose, milk and cream, given* frequently. Orange juice and water may be substituted for the milk and cream if the patient does not tolerate the latter. As soon as possible the patient is placed on a convalescent peptic ulcer diet.

A very liberal diet for this condition came from Denmark some years ago, where Meulengracht[6] reported excellent results with it. By this treatment the patient is fed from the very onset of the hemorrhage what is termed a "full purée" supplemented by doses of iron and alkalis, although alkalis are not considered necessary or desirable by some

[4] Kantor, J. L., and Kasich, A. M.: Handbook of Digestive Diseases, St. Louis, Mosby, 1949

[5] Andresen, A. F. R.: New York J. Med. 49:2311, 1949

[6] Meulengracht, E.: Lancet 229:1220, 1935.

PROGRESSIVE PEPTIC ULCER REGIMEN

In the Acute Stage:

Milk or milk and cream ....3 ozs. every hour alternating with alkaline powders on the half hour

Supplements (added one at a time).

Eggs ....Soft cooked or poached, once or twice daily
Cereal ....Cream of Wheat, rice, once or twice daily
Custard ....Substituted for an egg
Junket ....In addition to one of the milk and cream feedings

Later Additions:

Milk toast ....Made of white-bread toast and warm milk or milk and cream. May be substituted for cereal.
Cream soup ....Made of bland, low-residue vegetables such as peas, carrots, spinach and asparagus
Cheese ....Cottage or cream cheese. May be substituted for an egg

Convalescent Ulcer Diet:

Milk ....Milk, cream, buttermilk
Cheese ....Cottage, cream; other mild, soft cheeses. Cheddar cheese may be added later
Fats ....Butter or margarine
Eggs ....Soft cooked, poached, scrambled in double boiler
Meats, fish, fowl .....Scraped beef patty, minced, creamed or boiled chicken, poached fish
Soups ....Cream soups only, using the vegetables listed below
Vegetables ....*Puréed spinach, corn, peas, beets, carrots, squash, string* beans, tomato (strained infant foods may be used); mashed or baked potatoes (without skin)
[illegible] be substi-

Fruits [illegible] or baked
[illegible] ned pears, peaches and peeled apricots, purée of all dried fruits except figs

It is advisable to take citrus fruit juices after eating *some of the other foods of the meal, or to dilute them* half and half with water.

Breads, cereals, Italian pastes ....Enriched white bread, toasted or plain; refined cereals, all ready-to-eat cereals except those containing bran; strained oatmeal, plain white crackers, macaroni, spaghetti, noodles
Desserts ....Ice cream, plain, custard; *simple puddings of rice, corn*starch, tapioca or bread without fruit or nuts, gelatin desserts (with fruit as permitted above), sponge and [illegible]
[illegible] physician

unfortunate results However, many adults choose foods as unwisely, living for much of the day on doughnuts and pastries, accompanied by frequent cups of coffee or carbonated beverage, with a proper meal only in the evening. They abuse their stomachs not only with

some meats such as veal and pork, the frying of food at too low a temperature so that fat penetrates the food, or at too high a temperature so that irritating by-products are formed—*all these may* cause digestive discomfort.

Overeating, especially of very fatty or very sweet foods, may cause indigestion. Fat in excess inhibits the secretion of gastric juice and delays digestion unduly. Fried foods, heavy salad dressings, rich pastries, cheeses, nuts and certain fatty fishes are frequent offenders Concentrated sweets may also irritate the alimentary tract. Candy eaten between meals or on an empty stomach, cake with heavy icing and puddings rich with sweets and fat are conducive to indigestion

Rapid eating, particularly when under pressure, resulting in improper chewing and "bolting" of food cannot help but cause gastric discomfort if continued over a period of time

Fatigue and emotional strain are known to inhibit the flow of gastric juice Rest before meals, and light, simple meals will do much to bring digestion back to normal

Certain foods have been labeled as difficult to digest, although the reason is not always clear. Such foods as lobster, crab, sardines, peanuts and other nuts, raw apples, garlic and pickles are in this group. The gas-forming vegetables and fruits may cause discomfort, either because of coarse cellulose or their volatile oils Common gas-forming foods are cabbage and its relatives—Brussels sprouts, broccoli and cauliflower, dried peas and beans, onions, turnips, green peppers, cucumbers, radishes and melons. If any of these foods are known to be troublesome, they should be omitted from the diet. True food allergies are discussed in Chapter 26

Dietary Treatment

the convalescent ulcer diet but embodies some of the same principles (*see* p 302) Milk and cream, eggs, tender meats, fish and chicken, mild, soft cheeses, refined breads and cereals, and fruits and vegetables of low fiber content are permitted Fried foods, concentrated sweets, rich desserts, pickles, vinegar, spices and condiments should be avoided. Acid fruits and fruit juices may cause distress. Alcoholic beverages are contraindicated

It is important that the cause of the patient's indigestion be eliminated, whether this is due to poor food habits, fatigue or other factors described in the previous pages. Meals should be regular. The diet may be divided into 3 or 6 [illegible]

patient's needs.

The table on page 302 summarizes the important points in the dietary treatment of many gastric disorders as well as of indigestion.

Acute and Chronic Gastritis

Acute Gastritis. There is some difference of opinion as to whether acute gastritis is a functional or an organic disease. Gastritis is essentially an inflammation of the gastric mucosa. Acute gastritis may follow the ingestion of

physicians. The purée diet may be given as follows:

6 A.M.—Tea, white bread and butter
9 A.M.—Oatmeal with milk, white bread and butter
1 P.M.—Dinner (see below)
3 P.M.—Cocoa
6 P.M.—White bread and butter, sliced meats, cheese and tea

The dinner may include such foods as soup, creamed and puréed, minced and broiled meats, including liver, and poultry, broiled, baked or creamed fish; plain-cooked eggs, mashed potatoes, puréed vegetables and fruits; custard, plain ice cream and puddings—rice, cornstarch, tapioca and gelatin. White bread, crackers, butter and milk beverages are also included.

Prognosis. Whatever method of treatment is used, the patient must understand that ulcers heal slowly, that they often recur, and that he should be very cautious about discontinuing the prescribed diet. It may be necessary to continue the diet, with some modifications, for months and sometimes years.

Surgical Treatment

Peptic ulcer tends to be recurrent, precipitated possibly by nonadherence to the dietary prescription or by a renewal of emotional tension, or both. If the ulcer proves to be resistant to medical treatment, or if it recurs fairly frequently, surgery is usually resorted to.

For the diet regimen following surgery for peptic ulcer and for the dietary treatment of the "dumping syndrome" see Chapter 32.

OTHER DISORDERS OF THE UPPER GASTRO-INTESTINAL TRACT

Cardiospasm

Cardiospasm occurs at the junction of the esophagus into the stomach, where the sphincter muscle separates the two organs. Sleisenger *et al*[7] have shown that this is a disorder of the nervous control of the opening and the closing of the sphincter muscle. Food does not pass from the esophagus into the stomach, and vomiting and loss of weight are a common symptom. Dilatation and inflammation of the lower end of the esophagus may also result.

The patient may be treated by a series of dilatations of the stricture if the cardiospasm is severe. The diet should be bland and nonstimulating (see p. 302) so as not to irritate the esophagus, and may have to be high in calories and protein if much weight has been lost. Frequent small feedings may be better tolerated than 3 large meals.

Indigestion

[illegible]

under the sternum. Others have eructation of gastric juice or complain of frequent belching and a sense of fullness. On gastric analysis such patients may be found to have increased gastric secretion, or they may have decreased secretion, but no indication of organic gastric disease. Physicians differ as to the importance to be attached to an increase or a decrease of hydrochloric acid in the gastric juice when not accompanied by other findings. Some believe that this condition is not incompatible with good health, while others feel that it may be the precursor of more serious disease. Since functional disorders may be the forerunners of organic changes, the cause of indigestion should be found and remedied.

Some of the causes of disturbed digestion are: improper selection of food, improper food preparation, overeating, rapid eating and "bolting" of food, fatigue; emotional strain; idiosyncrasies to certain foods.

The best-known example of improper selection of food is the child who eats a quantity of green apples, with the usual

[7] Sleisenger, M. H., *et al.*, Gastroenterology 25:333, 1953.

unfortunate results However, many adults choose foods as unwisely, living for much of the day on doughnuts and pastries, accompanied by frequent cups of coffee or carbonated beverage, with a proper meal only in the evening They abuse their stomachs not only with stimulating but unsatisfying food, in no way do they meet the nutritional needs of the body, a fact which in itself may lead to poor health and in turn to poor gastric function.

Food improperly prepared may be a cause of gastric discomfort Undercooking, especially of starchy foods and of some meats such as veal and pork, the [illegible]

[illegible] of gastric juice and delays digestion unduly. Fried foods, heavy salad dressings, rich pastries, cheeses, nuts and certain fatty fishes are frequent offenders Concentrated sweets may also irritate the alimentary tract Candy eaten between meals or on an empty stomach, cake with heavy icing and puddings rich with sweets and fat are conducive to indigestion

Rapid eating, particularly when under pressure, resulting in improper chewing and "bolting" of food cannot help but cause gastric discomfort if continued over a period of time

Fatigue and emotional strain are known to inhibit the flow of gastric juice. Rest before meals, and light, simple meals will do much to bring digestion back to normal

Certain foods have been labeled as difficult to digest, although the reason is not always clear Such foods as lobster, crab, sardines, peanuts and other nuts, raw apples, garlic and pickles are in this group. The gas-forming vegetables and fruits may cause discomfort, either because of coarse cellulose or their volatile oils. Common gas-forming foods are cabbage and its relatives—Brussels sprouts, broccoli and cauliflower, dried peas and beans; onions, turnips, green peppers, cucumbers, radishes and melons If any of these foods are known to be troublesome, they should be omitted from the diet. True food allergies are discussed in Chapter 26.

Dietary Treatment

[illegible] the convalescent ulcer diet but embodies some of the same principles (*see* p 302) Milk and cream, eggs, tender meats, fish and chicken, mild, soft cheeses, refined breads and cereals, and fruits and vegetables of low fiber content are permitted Fried foods, concentrated sweets, rich desserts, pickles, vinegar, spices and condiments should be avoided Acid fruits and fruit juices may cause distress. Alcoholic beverages are contraindicated

It is important that the cause of the patient's indigestion be eliminated, whether this is due to poor food habits, fatigue or other factors described in the previous pages Meals should be regular. The diet may be divided into 3 or 6 [illegible] patient's needs

The table on page 302 summarizes the important points in the dietary treatment of many gastric disorders as well as of indigestion.

Acute and Chronic Gastritis

Acute Gastritis. There is some difference of opinion as to whether acute gastritis is a functional or an organic disease. Gastritis is essentially an inflammation of the gastric mucosa. Acute gastritis may follow the ingestion of

Bland Diet

Principles:

1. Low or soft residue and connective tissue
2. Little or no condiments, except salt in small amounts
3. Low in acid content
4. Foods simply prepared

Foods Allowed:

Milk . . . . Milk, cream, buttermilk, yoghurt

veal chops; boiled, broiled or roast chicken; fresh tongue, liver, sweetbreads, baked, boiled or broiled fish

Soups . . . . With milk or cream-sauce foundation

Vegetables . . . . Potatoes, peas, squash, asparagus tips, carrots, tender string beans, beets, spinach. (In severe cases these vegetables are puréed.)

Fruits . . . . Orange juice, ripe bananas, avocados, baked apple (without skin), applesauce, canned peaches, pears, apricots, *white cherries*, *stewed prunes*

Bread, cereals, Italian pastes . . . . White bread and rolls, crackers, all refined cereals, macaroni, spaghetti, noodles

D . . . r com- . . . e cake, . . . , (if tol-

Foods To Be Avoided:

Fats . . . . Fried or fatty foods

Desserts, sweets . . . . . . Pastries, preserves, candies

Beverages . . . . Alcoholic beverages, carbonated drinks unless prescribed by the doctor

Condiments . . . . Pepper, other spices, vinegar, ketchup, horseradish, relishes, gravies

Typical Menu for Bland Diet

Breakfast	*Dinner*	*Supper*
Banana, ripe	Roast lamb	Cream of potato soup
Farina with milk	Mashed potatoes	Scrambled eggs
1 egg, poached	Peas	Fresh spinach
White-bread toast	White bread	White bread
Butter or margarine	Butter or margarine	Butter or margarine
Coffee or substitute	Canned pears	Applesauce with sugar cookies
Cream	Tea or milk	Milk
	Cream	Small glass orange juice
	Small glass tomato juice	

toxic substances, such as alkalis, strong acids, alcohol and certain drugs.

THE TREATMENT should include elimination of the offending substance as soon as possible. This is accomplished by induced vomiting or by lavage, and is followed by fasting for an appropriate interval. During this time, fluids usually

such as homogenized milk, or buttermilk, or a strained gruel, and repeating in half an hour if no ill effects result from the first feeding. Both the amount and the interval should be increased until from 6 to 8 ozs. are given at 2-hour intervals. Solid foods should be added to the diet slowly, crisp dry toast or crackers being the first addition to the liquid food. Toasted cereal flakes, well-cooked cereals, such as rice or Cream of Wheat, and a soft-cooked egg may be given on the third and the fourth days of feeding. A light diet (*see* Chap. 18) should be used when the patient's con-

only a few days.

Chronic Gastritis. Chronic gastritis may accompany organic disease lesions such as ulcer and cancer, or it may be a disease entity of its own. Although no specific lesion may be present, the gastric mucosa is engorged and friable, and the patient complains of continued gastric discomfort.

Causative factors may be those discussed under indigestion, such as con-

covering the cause and treating the patient accordingly. If the contributing cause is improper eating or drinking, he must be convinced that recovery depends upon the avoidance of the specific factor causing the irritation. The food must be easily digested and be simply and appetizingly prepared. A bland or a convalescent ulcer diet (*see* p. 302, also pp. 298-299) will meet the needs of these patients and must be continued until the gastric mucosa is restored to its normal condition.

Hiatus Hernia

The term *hiatus* or *diaphragmatic hernia* refers to herniation of the upper part of the stomach into the thoracic cavity. Since this occurs in the area of the diaphragm through which the esophagus normally passes into the stomach, there may be constriction of the stomach at this point. The resulting discomfort may express itself as substernal pain, heartburn and poor appetite. Sometimes an ulcer will be found at the area of constriction.

The best treatment at present is thought to be conservative and medical, using antacids, pneumoperitoneum and either a bland or a convalescent ulcer diet (*see* p. 302, also pp. 298-299).[8, 9] Should the patient be overweight, reduction of weight is important, so that no superfluous tissue presses against the diaphragm. No constricting abdominal garments should be worn. In severe cases or in those which do not respond to medical therapy, surgery may be advised.

Cancer of the Stomach

Delayed Diagnosis. Because the

effect a cure. For this reason, any continued abdominal discomfort should be investigated, even though seemingly in-

[8] Texter, E. C., Jr., *et al.*: J.A.M.A. 160:830, 1956.

[9] Evans, A., and Maisel, B.: Am. J. Nursing 57:1290, 1957.

consequential. This is another reason why a periodic physical examination is of importance

Symptoms and Diagnosis. Lack of appetite over a considerable period of time with loss of weight and strength are symptoms suggestive of carcinoma. Vomiting may occur and sometimes newly acquired constipation is a symptom The absence of free hydrochloric acid in the gastric contents is suggestive, although in the earlier stages it may be increased Occult blood is frequently present in the stools The most important method in diagnosing cancer is by roentgenogram. The early discovery of this condition, when surgical intervention is more likely to be successful, is of utmost importance.

Dietary Adaptations. When an operation has been performed, the diet should follow that outlined in the chapter on preoperative and postoperative diets (*see* Chap. 32).

Often in inoperable carcinoma of the stomach, patients feel that if only they could eat they would get well, therefore, [illegible] A bland [illegible] most by serving a regular house diet as long as possible and letting him choose from his tray what appeals to him.

STUDY QUESTIONS

1. Trace the pathway of digestion. Where do the processes of digestion chiefly take place? Why is a so-called "nutrient enema" of little value?

2. What does the doctor look for when doing a gastric analysis? Why must the patient be in a fasting state? Define hyperchlorhydria; hypochlorhydria; achlorhydria

3. What are some of the possible causes of gastric and duodenal ulcer?

4. Of what does the patient with peptic ulcer usually complain?

5. Explain the principles underlying the dietary treatment of peptic ulcer.

6. Why is an alkaline medication given to patients with ulcers?

7. Why are milk and cream effective foods to counteract the hyperchlorhydria in peptic ulcer? Why cannot meat be given in the early stages? What foods must be omitted on a peptic ulcer diet?

8. A patient has been diagnosed as having a peptic ulcer and has been [illegible]

9 A patient on a convalescent ulcer diet works from 8.00 A.M. to 5:30 P.M and must buy his lunch. What suggestions can you make to enable him to follow his diet while at work? How can you be sure that the diet will be nutritionally adequate?

10. Using Chapter 11 as a guide, write a convalescent ulcer diet for a Jewish patient who carries his lunch to work, for a Puerto Rican elevator operator who works from 4 P.M. to midnight

11 What are the foods allowed on the Meulengracht diet? On the Andresen regimen? What are the principles underlying the use of food in bleeding gastric ulcer?

12. Write a menu for a day for a secretary with cardiospasm; for a housewife with "chronic indigestion." Use the foods allowed on the Bland Diet.

13. What are some of the common causes of indigestion?

14 Name some of the causes of gastritis. Plan a menu for a day for a patient with acute gastritis. Is it adequate for normal nutritional needs?

15. Make out a menu for a day for an underweight patient with a hiatus hernia who has been placed on a bland diet.

See Bibliography in Part Four for other pertinent material on the topics discussed in this chapter.

CHAPTER TWENTY-FOUR

Diseases of the Intestines

DIARRHEA

[illegible]

quantity and the water content of the feces are increased, and frequently there is undigested food in the stools The stools are semifluid and increased in number.

Causes of Diarrhea. Diarrhea may occur as an acute though short-lived manifestation, lasting 1 to 3 days, followed by complete recovery, or it may be the symptom of more serious disease In the former case it may be due to food poisoning by the staphylococcus organism, to dietary indiscretion or to some cause of unknown origin When diarrhea lasts more than a few days, or recurs after seeming recovery, the cause should be investigated thoroughly. Infections of the intestinal tract such as typhoid fever, bacillary or amebic dysentery or trichinosis may be the underlying cause of the diarrhea, there may be organic disease such as colitis or sprue, or it may be one of the symptoms of the deficiency disease pellagra.

Diet in Diarrhea

In an acute attack of diarrhea, food and fluids by mouth should be withheld for the first 24 hours Tea, toast and broth are usually well tolerated at the end of this time, and the patient is soon ready for a soft and then a regular diet (*See* Chap. 18.)

In diarrhea of longer duration, such as is found in dysenteries, the diet should be low in residue and may have to be high in calories if there has been weight loss Whole-grain bread and cereals and raw vegetables and fruits, except bananas and fruit juices, are omitted Calories can be added most easily by high caloric beverages (*see* Chap 50 for recipes) For the remainder of the dietary regimen see the chart on page 306.

REGIONAL ILEITIS

Regional ileitis, as its name implies, is a disease of the ileum, although the jejunum may be involved as well For this reason it is sometimes called re-

consequential This is another reason why a periodic physical examination is of importance

Symptoms and Diagnosis. Lack of appetite over a considerable period of time with loss of weight and strength [illegible]

tom The absence of free hydrochloric acid in the gastric contents is suggestive, although in the earlier stages it may be increased Occult blood is frequently present in the stools. The most *important method in diagnosing cancer* is by roentgenogram. The early discovery of this condition, when surgical intervention is more likely to be successful, is of utmost importance.

Dietary Adaptations. When an operation has been performed, the diet should follow that outlined in the chapter on preoperative and postoperative diets (*see* Chap. 32).

Often in inoperable carcinoma of the stomach, patients feel that if only they could eat they would get well; therefore, the diet is difficult to prescribe. A bland or a convalescent ulcer diet is indicated, or even a liquid diet, particularly if there is obstruction or bleeding. However, the patient's morale may be benefited most by serving a regular house diet as long as possible and letting him choose from his tray what appeals to him

STUDY QUESTIONS

1. Trace the pathway of digestion. Where do the processes of digestion *chiefly take place? Why is a so-called* "nutrient enema" of little value?

2. What does the doctor look for when doing a gastric analysis? Why must the patient be in a fasting state? Define hyperchlorhydria, hypochlorhydria, achlorhydria.

3. What are some of the possible causes of gastric and duodenal ulcer?

4. Of what does the patient with peptic ulcer usually complain?

5. Explain the principles underlying the dietary treatment of peptic ulcer.

6 Why is an alkaline medication given to patients with ulcers?

7. Why are milk and cream effective foods to counteract the hyperchlorhydria in peptic ulcer? Why cannot meat be given in the early stages? What foods must be omitted on a peptic ulcer diet?

8 A patient has been diagnosed as having a peptic ulcer and has been [illegible]

9. A patient on a convalescent ulcer [illegible] tions can you make to enable him to follow his diet while at work? How can you be sure that the diet will be nutritionally adequate?

10. Using Chapter 11 as a guide, write a convalescent ulcer diet for a Jewish patient who carries his lunch to work, for a Puerto Rican elevator operator who works from 4 P.M. to midnight

11. What are the foods allowed on [illegible] On the Andresen [illegible] ulcer.

12. Write a menu for a day for a secretary with cardiospasm, for a housewife with "chronic indigestion." Use the foods allowed on the Bland Diet.

13. *What are some* of the common causes of indigestion?

14. Name some of the causes of gastritis Plan a menu for a day for a patient with acute gastritis. Is it adequate for normal nutritional needs?

15. Make out a menu for a day for an underweight patient with a hiatus hernia who has been placed on a bland diet.

See Bibliography in Part Four for other pertinent material on the topics discussed in this chapter.

thickening of the intestinal wall and narrowing of the lumen of the bowel Anemia may be present due to blood loss The most common symptoms are persistent diarrhea and pain

Dietary Treatment

Because of the persistent diarrhea there may be marked malnutrition If the disease is extensive, there will be poor absorption of food, further accentuating the poor nutrition The diet should be low in residue and high in calories and protein as under the diet for colitis (*see* pages following) Seasonings and cold fluids are not well tolerated and should be omitted Vitamin supplements may have to be given as additions to the diet If medical treatment fails to restore the patient to health, surgery may be indicated [1]

COLITIS

Colitis is an inflammatory disease of the colon It is characterized by friability and hyperemia of the mucosa, leading to many small areas of bleeding ulceration. This may involve only a part of the rectum or the colon, but in advanced stages of the disease it usually involves the entire area of the large bowel The stools, which may be as frequent as 15 to 20 a day, are semiliquid and contain blood and mucus The patient suffers from the discomfort of the frequent stools, which may be accompanied by cramps, but usually also he is malnourished and often to an extreme degree Anemia may be present due to blood loss, and the patient may be underweight The disease is usually treated conservatively by medical means, but in advanced cases surgery may be resorted to and a colostomy performed See page 313 for the diet in the latter case

The etiology of colitis is unknown No organism has been isolated as a cause of the disease There are indications that colitis may occur on an emotional basis, since these patients are often very painstaking and meticulous and seem to have more than an ordinary dependence on others [2]

Dietary Treatment

There are two schools of thought in regard to the dietary treatment of colitis The frequency of the stools and the degree of bleeding and ulceration of the colon would seem to demand the use of a diet low in residue and as high in calories and protein as can be tolerated by the patient

High Protein. The diet should be high in protein to rebuild lost tissue Tender meats, with little connective tissue, fish and chicken should be included twice a day Eggs usually are well tolerated, and two or three cooked in desserts or as eggnogs may be given each day. Milk and cheese may or may not be tolerated If ordinary fluid milk causes discomfort, boiled or evaporated milk sometimes can be substituted with good effect High protein beverages should be given if the patient does not eat enough protein in his regular meals (*see* Chap 50 for recipes) An inexpensive source of additional protein in the diet is dry skim milk powder, which may be added to fluid milk beverages or to other foods such as creamed dishes, mashed potatoes or desserts (*see* Chap 49 for recipes).

High Caloric. Due to the loss of food substances in the stools and the patient's often capricious appetite, weight loss is a frequent symptom of colitis Calories may be increased in the diet by more bread and cereals, simple desserts and jellies and also more butter and cream if the patient tolerates them The high protein beverages mentioned in the previous paragraph may be made high caloric by the addition of lactose and chocolate or other fountain syrup.

[1] Almy, T P, in Cecil, R L, and Loeb, R F. Textbook of Medicine, ed 9, Philadelphia, Saunders, 1955

[2] Grace, W J, and Wolff, H G: J A M A 146.981, 1951

DIETS VARYING IN RESIDUE

FOODS	SOFT DIET	MODERATELY LOW RESIDUE DIET	VERY LOW RESIDUE DIET
Milk	Milk, buttermilk, cream	Same	Same. Boiled or evaporated milk may be tolerated better than pasteurized milk.
Cheese	Cottage, cream, Cheddar	Same	Cottage, cream only, if tolerated
Fat	Butter, margarine	Same	Same
Eggs	Cooked, poached, scrambled in double boiler	Same	Same
Meat, fish fowl	Tender chicken, fish, sweetbreads; ground beef and lamb	Same	Scraped beef, minced chicken and fish
Soups and broths	Broth, strained cream soups	Same	Broth only
Vegetables	Cooked vegetables. asparagus, peas, string beans, spinach, carrots, beets, squash; potatoes, boiled, mashed, creamed, scalloped, baked	Vegetable juice; vegetable purée, cooked asparagus tips, carrots; potatoes as for soft diet	Unseasoned vegetable juices in limited amounts
Fruits	Fruit juices, cooked and canned fruits (without skins, seeds or fiber), bananas	Fruit juice, fruit purée, ripe bananas, cooked, peeled apples, apricots, peaches, pears, plums	Fruit juices, preferably citrus, in limited amounts
Bread, cereals, Italian pastes	Whole-grain or enriched bread and cereals, macaroni, spaghetti, noodles, crackers	Refined, enriched bread and cereals only, macaroni, spaghetti, noodles, white crackers	As in moderately low residue
Desserts	Ices, ice cream, junket, cereal puddings, custard, gelatin, plain cake and cookies, all without fruit and nuts	Same	Same
Beverages	Tea, coffee, cocoa, milk and milk beverages, carbonated beverages	Same	Tea, Postum, coffee as permitted, milk and milk beverages if tolerated
Condiments	Salt, moderate amounts of pepper, other mild spices, sugar	Salt and sugar only	Salt in small amounts, sugar

gional enteritis. The condition is characterized by hyperplasia (enlargement due to cell *increase*) of the lymphatics, which eventually interferes with the blood supply of the mucosa of that section of the intestinal tract which is affected. This in turn gives rise to edema and ulceration, scarring of the mucosa,

GLUTEN-FREE DIET

Characteristics:

1. All forms of wheat, rye, oatmeal, buckwheat and barley are omitted, except gluten-free wheat starch
2. All other foods are permitted freely, including fats and starches
3 The diet should be high in protein and calories, and probably in minerals and vitamins if malnutrition is present After that, the diet should be sufficient to maintain normal growth and development in children, and normal weight in adults

Foods Allowed:

Milk	2 glasses or more. Flavored if desired More for children
Cheese as desired	Cottage and pot cheese only for very young children
Fats	Butter and other fats as desired (Note restrictions under "Foods To Be Avoided")
Eggs	1 to 2 a day
Meat, fish, fowl	1 or 2 servings daily (not breaded, creamed or served with thickened gravy, no bread dressings) Otherwise prepared as desired
Soups	All clear and vegetable soups, cream soups thickened with cream, cornstarch or potato flour only
Vegetables	As desired, except creamed Include 2 servings of green or yellow vegetables and at least 1 raw vegetable daily (The last may be omitted for very young children) Rice may be substituted occasionally for potato
Fruits	As desired, 2 or 3 servings daily. Include citrus fruit once a day.
Bread and cereals	Bread made from rice, corn or soybean flour and gluten-free wheat starch only Cornflakes, corn meal, hominy, rice, Rice Krispies, Puffed Rice, precooked rice cereals
Desserts	Any of the following jello, fruit jello, ice or sherbet, homemade ice cream, custard, junket, rice pudding, cornstarch pudding (homemade) or blanc mange if thickened with cornstarch
Beverages	Milk, fruit juices, ginger ale, cocoa. (Read label to see that no wheat flour has been added to cocoa or cocoa syrup) Coffee (made from ground coffee), tea, carbonated beverages
Condiments and sweets	Salt, sugar, white or brown, molasses; jellies and jams, honey, corn syrup

Foods To Be Avoided:

Fats	[illegible]
Meat,	stuffings All gravies or cream sauces thickened with wheat flour

(Continued on next page)

ing mucosa of the colon. Only refined breads and cereals, preferably enriched, should be served. Raw vegetables and *fruits, with the exception of well-ripened* bananas, should be omitted In severe

bage family, turnips, onions and dried peas and beans should always be avoided. See page 306 for a variety of diets restricted in residue.

Self-Selected Diet. If the disease is *treated on the basis of an emotional dis-*order, the diet may be of importance only as it helps the patient to achieve some degree of independence. Under this regimen the patient is allowed to *choose his own diet and is encouraged* to try whatever food appeals to him, even those which would seem to be contraindicated, such as foods high in residue. The nurse and the dietitian *must be supportive as well as permissive,* giving the patient confidence and encouraging him to make his own decisions *As the patient's feeling of secu-*rity increases, he will eat larger and more nutritious meals, with the subsequent healing of the colon and a gain in weight and strength

Nursing Problem. *Whichever reg-*imen is adopted, recovery is often slow and there are likely to be setbacks. Patients with colitis are fussy about their food and often extremely hard to please. *They have the irritability of the badly* nourished patient and need much under-

Fortunately, patients often recover *spontaneously, at least for a time,* and can return to a more or less normal diet.

SPRUE

Sprue, known also as idiopathic

sprue found in the temperate zone, known as nontropical sprue, is quite different from that of so-called tropical sprue. The latter responds dramatically to therapy with folic acid or vitamin B_{12} and an adequate diet, quickly restoring the patient to normal health and vigor. Here we shall be concerned only with nontropical sprue. Until recently it has

The sprue syndrome is characterized by diarrhea, with the passing of at least 2 or 3 stools a day. These are described as bulky, foamy, light colored and foul smelling They contain a high percentage of fatty acids and calcium soaps, resulting from incomplete absorption in the intestinal tract. The term *steatorrhea* (fatty diarrhea) is applied to this finding, and the disease is sometimes called the "malabsorption syndrome." It occurs not only in sprue but also in similar diseases such as celiac disease (*see* Chap. 33). *The tongue and the mouth may* be so sore that eating is difficult, indicating a deficiency of the B vitamins Anemia is a common symptom, and in the latter stages osteomalacia (loss of calcium from the bones due to lack of calcium absorption from the intestinal tract) may occur.

Etiology

Until very recently the etiology of sprue and celiac disease was unknown. As has been indicated, it is a disorder which interferes with the absorption of fatty acids, the end-products of fat digestion, so that large amounts appear in the stool. Starches may also appear

3 Cecil, R L, and Loeb, R F: Textbook of Medicine, ed. 9, Philadelphia, Saunders, 1955.

diet. The term *gluten-free* diet, therefore, is a misnomer, and *wheat-, rye-* and *oat-free* is more accurate terminology.

The exclusion of all cereal grains except corn and rice from the diet may seem to be an easier matter than it actually is. Wheat-flour and wheat-bread products are used in such a variety of ways in food preparation that their elimination poses many problems. Not only must all wheat bread and rolls be omitted, both white and whole wheat, but all breaded products, bread stuffing, gravies and cream sauces thickened with wheat flour, macaroni, spaghetti, noodles, biscuits, crackers, cakes and cookies made from wheat flour must be eliminated from the diet. Rye grain, with the exception of rye breads, pretzels and Ry-Krisp, is less commonly used and, therefore, is omitted more easily. Oatmeal is excluded, as it caused a recurrence of symptoms when reintroduced into the diet. Barley and buckwheat are also excluded, as their effect in the intestinal tract in this disease is not known For adults, beer and ale must be omitted, since they may contain cereal grain residues[9]

In place of the cereals which must be excluded, bread, biscuits and cookies made from rice, corn and soy flour and wheat starch are allowed (*see* Chap 50, Therapeutic Recipes). Cornflakes, corn meal, hominy, rice, Rice Krispies, Puffed Rice and precooked rice cereals may be used. Cornstarch and potato flour can be used to thicken gravies and cream sauces Because wheat flour is in such common usage, it is well to read the labels on all commercial foods before using them on this diet to be sure that no wheat flour has been used in their preparation. Postum, malted milk and Ovaltine are examples of commercial products made from or containing cereal grains (*See* Foods Allowed and To Be Omitted on pp 309 and 310.)

[9] Sleisenger, M. H, Rynbergen, H J., *et al* · J Am. Dietet A. 33 1137, 1957.

Although striking improvement has been seen in most patients with nontropical sprue on a wheat-, rye- and oat-free diet, not every case has responded in this manner. The use of cortisone with or without the diet has been of benefit to such patients.[10]

CONSTIPATION

A common disturbance of the digestive tract is constipation However, there is considerable confusion as to what is meant by this term. Although a daily bowel movement has been stressed as desirable by health experts, there are many people for whom an evacuation every other day or even every third day is normal Moreover, evacuation may occur regularly until a temporary strain occurs, in which case there may either be an increased number of bowel movements, almost a diarrhea, or retention of the feces for a day or two, resembling constipation The matter usually straightens itself out when the strain is relieved However, if the person becomes anxious when no daily bowel movement occurs and begins to resort to cathartics or enemas, a vicious pattern is set up, and it may be difficult to effect a return to normal habits.

When there is no regularity of any kind in evacuation, it is well to inquire into the patient's dietary and living habits. Insufficient rest, hurried, irregular meals, a food intake which does not meet the nutritional needs of the body, and too sedentary a life all may contribute to poor bowel function The problem here is to help the patient to accept a more regular mode of living, including a diet that meets all his nutritive requirements and a reasonable amount of exercise

In some cases of constipation, actual changes in the bowel have occurred. One such type of constipation, called atonic, has, as its name implies, decreased tone of the musculature of the

[10] Adlersberg, D New York J. Med 55: 3575, 1955

Soups	All canned soups except clear broth. All cream soups unless thickened with cream, cornstarch or potato flour
Vegetables	Any prepared with cream sauce or breaded
Bread, cereals, Italian pastes	All bread, rolls, crackers, cake and cookies made from wheat or rye; Ry-Krisp; muffins, biscuits, waffles, pancake flour and other prepared mixes; rusks, Zwieback, pretzels, any product containing oatmeal, barley or buckwheat Breaded foods, bread crumbs All wheat and rye cereals, wheat germ, barley, oatmeal, *buckwheat, kasha* Macaroni, spaghetti, noodles, dumplings
Desserts	Cakes, cookies, pastry; commercial ice cream and ice-cream cones; prepared mixes, puddings All homemade [illegible] ale [illegible] (Read labels)

WARNING Read labels on all packaged and prepared foods.

in increased quantities in the stool, although simple sugars such as glucose and those found in fruits and fruit juices are well tolerated The diet, therefore, has been high in protein and low in starch and fat

There are some indications to suggest that nontropical sprue may be a very severe form of sensitivity to one of the protein fractions of some of the cereal grains. In 1951, van de Kamer and his co-workers[4] discovered that the excretion of fatty acids in celiac disease, a disease similar to sprue, was decreased markedly when wheat, rye and oats were omitted from the diet Both they and other investigators[5] have since shown that all foods are well tolerated, including fats and starch, so long as all cereal grains, except rice and corn, both *very low in this protein fraction, are* excluded from the diet Wheat starch, free of wheat protein, and soya flour, obtained from soya beans, also are well tolerated

[4] van de Kamer, J. H. *et al*: Acta Paediat 42 223, 1953

[5] Sheldon, W, and Lawson, D.. Lancet 2·902, 1952

Since the reports of these investigators, the wheat-, rye- and oat-free diet, effective in celiac disease, has been tried on patients with nontropical sprue with equally good results [6, 7]

"Gluten-Free" Diet

[illegible]

their patients' inability to absorb fat and, therefore, called their diet "gluten free" They have since shown[8] that it is a protein with a specific configuration found in all cereal grains and many other protein foods which causes the symptoms. Only wheat, rye and oats (and possibly barley which so far has not *been tested on patients) carry* a large enough content of this protein to make it necessary to exclude them from the

[6] Ruffin, J M, *et al* New England J Med 250 281, 1954

[7] Schwartz, M K, Sleisenger, M H, *et al* Gastroenterology 32 232, 1957.

[8] van de Kamer, J H, and Weijers, H. A: Acta paediat 44:465, 1955.

be all that is necessary to prevent constipation and straining Other simple remedies are lemon juice in hot water or a cup of hot coffee before breakfast. Whatever procedure has helped a patient in the past should be permitted him in the hospital so long as it is not contraindicated. Only if these methods fail should cathartics be prescribed

CANCER OF THE BOWEL AND COLOSTOMY

In all cases of constipation, or of constipation alternating with diarrhea, particularly if these symptoms are of short duration and in the face of otherwise normal living habits, there is the possibility of neoplastic growth of some section of the colon or of the rectum If this diagnosis is established by the use of proctoscopic and x-ray examinations, the patient is subjected to surgery If the cancer is in the upper part of the colon, the bowel may be resected and the ends brought together and sutured If the cancer is in the sigmoid section of the colon or in the rectum, a colostomy is usually performed. The cancerous segment of the bowel is closed off and resected The proximal part of the colon is brought out upon the abdominal wall. This colostomy bud now becomes the permanent opening through which the bowel will discharge the feces

Dietary Treatment

If an anastomosis of the bowel segments has been done, the post-operative dietary regimen is little different from the usual one, except that it may progress more slowly. Nothing is given by mouth for several days, and then a clear liquid diet may be prescribed, again for several days This is followed by a full liquid diet. If healing is satis- [illegible]

If a colostomy has been performed, the patient is given nothing by mouth, followed by clear fluids, until healing of the colostomy bud is well established. The patient is then advanced to a full liquid diet and, if this is well tolerated, to a moderately low residue diet (*see* p. 306). Many patients with colostomies are able to return to their regular food habits, provided that these are adequate for their nutritional needs and that they omit foods which caused discomfort before they were ill Dericks[11] states.

[illegible]

[illegible]

DIVERTICULOSIS AND DIVERTICULITIS

Diverticula, or small pouches, sometimes appear at weak points along the walls of the intestines They may occur in the small intestine but are seen much more frequently in the colon There may be few or many. The condition is known as diverticulosis and may or may not be a source of trouble. However, when one or more of the pouches become infected or irritated, the condition is known as diverticulitis The infection may be due to an accumulation of feces in the pouches and may result in ulceration and perforation In the latter case surgery is indicated.

In diverticulitis without perforation, but with pain, tenderness and sometimes fever, the treatment is much the same as for appendicitis, i e, complete abstinence from food for from 24 to 48

[11] Dericks, V. C, and Robeson, K. A: Pub Health Nursing 41 16, 1949

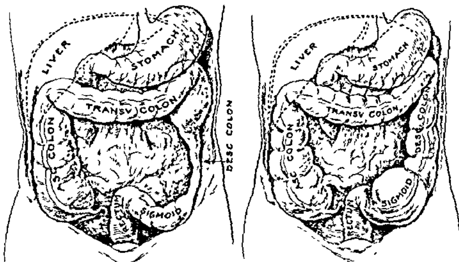


Fig. 75. (*Left*) Spastic constipation. Showing great constriction in the descending colon. Compare the colon in atonic constipation. (*Right*) Atonic constipation. Note the abnormal distention in the descending colon owing to its relaxed, atonic condition.

colon, and therefore enlargement of part or all of it. In the spastic type of constipation, there is increased tonicity, with a corresponding narrowing of part of the colon Bowel movements in the latter case may vary from a diarrhea to constipation.

Dietary Treatment

In most cases of so-called constipation, a normal diet (*see* Chap. 10) containing roughage in the form of fresh and cooked fruit and vegetables and including whole-grain bread and cereals will provide sufficient bulk to maintain regular bowel evacuation Where such regularity needs to be re-established—for instance, following an illness in which the mobility of the patient has been greatly limited—the addition of stewed fruit and stewed fruit juices to the ordinary diet will be found helpful.

In atonic constipation it may be necessary to increase the bulk by the inclusion of a salad both at lunch and at dinner, and by an increased use of fresh fruits. Bran cereal may be of help, but occasionally a bran bolus is formed which actually obstructs the bowel

Conversely, if the patient has spastic constipation, the diet should contain only soft residue until healing and the release of spasm have taken place (*see* p. 306). Only refined bread and cereals and cooked fruits and vegetables should be served This type of patient may benefit particularly from the addition to the diet of stewed fruit and fruit juices.

Nursing Problems

Patients in the hospital, particularly those confined to bed, may suffer from constipation because of strange surroundings or inactivity. Older patients on bed rest may develop fecal impaction unless they are carefully checked for regularity of evacuation. Patients with heart disease should be prevented from straining at stool Immobilized patients, either in a cast or for other reasons, may need help in maintaining regular bowel habits. For such patients the generous inclusion of stewed fruit and stewed fruit juices in a well-balanced diet may

CHAPTER TWENTY-FIVE

Diseases of the Liver, the Biliary Tract and the Pancreas

FUNCTIONS OF THE LIVER AND THE GALLBLADDER

The liver is not only the largest glandular organ of the body but one of the most important because of the diversity of functions which it performs, yet it is known as the "silent" organ because its owner is seldom aware of its presence or its functioning It may well be compared with a modern industrial plant, performing within its confines processes of manufacturing, storing, routing and distributing and, finally, conversion of several types of waste products to nontoxic substances

Production and Role of Bile

One of the functions of the liver is the production of bile, which plays an important part in the digestion and the absorption of fats Bile, after its manufacture in the liver, is collected by many small bile ducts and emptied into the hepatic duct, which carries it away from the liver. The hepatic duct leads to the cystic duct and to the gallbladder. In the gallbladder the bile is concentrated by the absorption of water and also stored When, in the course of digestion, fat arrives in the duodenum, it stimulates the production of a hormone—cholecystokinin—in certain cells of the duodenum The hormone is carried by the blood stream to the gallbladder and its ducts, causing them to contract. The bile re-enters the cystic duct and is forced down the common duct into the intestine (*see* Fig 76) The pancreatic

hours, with only sips of water or cracked ice. Gradually, liquid foods are added, then a low residue diet should be followed until all symptoms have subsided (*see* p. 306) When diverticulosis has been diagnosed, even though without acute symptoms, the patient should be put on a bland diet such as is found on page 302.

HEMORRHOIDS

Hemorrhoids are varicose veins around the anal sphincter. They may be internal or external Some of the causes of the condition are childbearing, constipation and the long-continued use of cathartics and enemas. The symptoms are bleeding, itching and pain. The purpose of the treatment is to restore normal function of the intestinal tract. A bland [illegible] ment. Surgery is used in severe cases.

STUDY QUESTIONS

1. What are the differences between a soft, a moderately low and a very low residue diet?
2 Plan a high caloric, low residue diet for a patient suffering from amebic dysentery.
3. Why must the patient with ileitis have a low residue diet? Can such a diet meet all the patient's nutritional requirements? How may additional calories and proteins be obtained?
4. What problems is the nurse likely to encounter in regard to the food habits of the colitis patient? What should be her attitude toward these?
5 What are the reasons for giving a colitis patient a high protein, high caloric, low residue diet? What is the rationale for allowing him self-selection in diet?
6. Why is the so-called "gluten-free" diet used in sprue? Which cereals must be omitted?
7. Write a menu for a day for a sprue patient living at home, for a secretary with sprue who eats her lunch at a drugstore counter.
8. What additions to the diet will help many patients who have a tendency to constipation?
9. Why may hospitalized patients develop constipation? Which groups especially need to be watched? Name some simple remedies by which the problem may be corrected without using cathartics.
10 Write a menu for a day for a patient who has had a colostomy. He is on a general diet but cannot tolerate gas-forming vegetables.

See Bibliography in *Part Four* for other pertinent material on the topics discussed in this chapter.

the waste product urea, while the remainder of the molecule is used as carbohydrate (58%) or fat (42%).

A very important function of the liver is the role it plays in the metabolism and [illegible] liver also supplies the antianemic factor which is concerned with the development of the red blood cells in the bone marrow (*see* Chap. 29)

Most of the vitamin A stored in the body is found in the liver The conversion of carotene into vitamin A takes place in the liver Vitamin D is also stored in the liver The livers of fish are especially rich as storehouses of these vitamins

It is now known that other vitamins—the B complex, ascorbic acid and, to some degree, vitamin K—are also stored there.

Detoxification

The liver performs the function of detoxifying harmful substances into nontoxic compounds. Substances toxic to the body may be ingested with food or taken as drugs. Bacterial action in the intestinal tract has been thought to produce irritating or toxic compounds. When these are absorbed from the intestinal tract via the portal circulation, the liver alters them chemically, so that no harm is done.

The liver also is involved in the detoxification of metabolic fragments, such as ammonia This is an intermediary product of the breakdown of amino acids to form urea. The liver is thought also to change some of the hormones to inactive substances after their work is done.

PATHOLOGIC CONDITIONS

It is not surprising that an organ which performs so many functions as the liver should manifest many and far-reaching symptoms when it is diseased Fortunately, the liver, if given proper care and treatment, has remarkable reserve power for regeneration and repair.

Jaundice

Jaundice is a symptom of a number of diseases of the liver and the biliary tract It may be obstructive, toxic or hemolytic Jaundice is recognized as a yellow pigmentation of the body tissues due to the presence in the blood of more than the normal amount of bile pigments

Obstructive jaundice, which is by far the most common, may be due to inflammation in the mucosa of the ducts, to stone formation or to pressure by tumors or adhesions These obstruct the bile flow at some point, either partially or completely.

Toxic jaundice may be caused by poisons, drugs or a virus, as in infectious hepatitis (*see* bottom of page).

Hemolytic jaundice, which is much less common, is caused by diseases in which the red blood cells are broken down in the body in large numbers

Biliousness A so-called bilious attack may or may not be related to a diseased liver It is caused more frequently by overeating, by the unwise selection of foods or by constipation, although it is known that digestive disturbances are among the more common symptoms of diseases of the liver and the biliary tract.

DISEASES OF THE LIVER

Two of the principal diseases of the liver in which dietary treatment plays an important role are infectious hepatitis and cirrhosis

Infectious Hepatitis

Etiology and Symptoms. Hepatitis is a general term which may be used to include injury to the liver cells themselves as a result of bacterial or viral infections, toxins and drugs The most important example of hepatitis is infectious or viral hepatitis, which used to be

duct joins the common duct just before this point.

Bile is composed of bile salts, bile pigments, cholesterol, inorganic salts and water. Approximately 500 to 1,100 cc. is produced daily

With the aid of peristalsis and segmentation, bile emulsifies the fat in the intestinal tract by breaking up the larger globules into many smaller ones This creates a greater surface area for the digestive enzymes to act upon

The bile salts aid in "ferrying" the fatty acids across the intestinal wall during absorption In diseases in which the *amount of bile in the intestinal tract is* diminished, we find interference with the absorption of fats and also with some of the fat-soluble vitamins.

The bile pigments are breakdown products of hemoglobin and have no known role They give the feces the characteristic green-brown color When bile is absent from the intestinal tract, so-called clay-colored stools result.

The function of the other constituents of bile is not known They may be waste products.

Metabolism and Storage

Another important function of the liver is its role in the metabolism of food. The liver stores some of the carbohydrate derived from the diet as glycogen and breaks it down to glucose as necessary in order to maintain the normal *blood-sugar level of from 70 to 100 mg.* per 100 cc of blood.

With the aid of choline, derived from the amino acid methionine, some of the fats are converted to lecithin in the liver. This seems to be an essential process in order that fats may be transported to the tissues in the body. When this conversion does not occur because of disease, fat stasis in the liver results and may become a serious condition.

The liver controls the distribution of the amino acids to the tissues, where they are used for growth and tissue repair. It synthesizes some of the amino *acids absorbed from the digestive tract* into the plasma proteins, albumen, fibrinogen, prothrombin and possibly globulin. Excess amino acids are split into the nitrogenous portion which forms

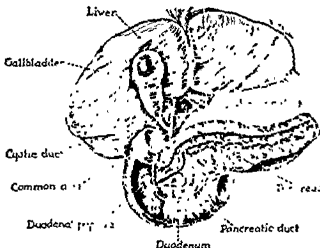


Fig 76 The hepatic duct from the liver unites with the cystic duct from the gallbladder, forming a common bile duct opening into the small intestine. (Greisheimer: Physiology and Anatomy, Philadelphia, Lippincott)

High Protein, High Carbohydrate, Moderate Fat Diet

Foods Allowed:

Milk	Milk, buttermilk—at least a quart a day, cream.
Cheese	All types unless salt is restricted
Fats	Butter or margarine
Eggs	Two or more a day—boiled, poached, scrambled in double boiler, eggnog
Meat, fish, fowl	Two large servings a day of lean beef, veal, lamb, chicken, liver, nonfatty fish
Soups	All varieties
Vegetables	Raw or cooked tomatoes, carrots, peas, wax or string beans, spinach and other greens, asparagus, squash, beets, salad greens (Omit raw vegetables if low residue is desired) Boiled, baked or mashed potatoes
Fruits	Fresh, canned or stewed, juices. (Omit raw fruits if low residue is desired)
Bread, cereals, Italian pastes	Whole-wheat or enriched white bread, rolls, crackers, cereals, macaroni, spaghetti, noodles. (Omit whole-wheat products if low residue is desired)
Desserts	Ice cream and sherbet, rice, tapioca, bread and cornstarch puddings, custard, junket, gelatin, plain cakes and cookies
Beverages	Milk, tea, coffee, cocoa
Sweets	Sugar, honey, jams, jellies in increased amounts
Condiments	Salt as allowed

Foods To Be Avoided.

Fats	All fried foods
Meat, fish, fowl	All meats high in fat such as fat pork, goose and duck; fatty fish
Vegetables	Gas-forming vegetables such as onions, turnips, cabbage, cucumbers, radishes
Desserts	Pastries
Beverages	All alcoholic beverages
Condiments	Pepper, spices, horseradish, mustard, ketchup

tom that is noticed first by the patient and that leads him to seek medical advice. Another complication of portal hypertension is the formation of varices (varicose veins) in the lower esophagus, since its veins empty into the portal vein. These varices may hemorrhage and complicate the ravages of this disease

Dietary Treatment

High Protein. As in the diet for hepatitis, the increased protein in the diet will help to regenerate liver tissue and prevent fat stasis It is also given in an attempt to increase the low serum proteins in the blood Generous amounts of meat, fish and fowl should be included in the diet, as well as plenty of milk, eggs and cheese It is sometimes difficult for the patient to consume the [illegible]

called catarrhal jaundice. This disease was one of the chief causes of illness among our armed forces in World Wars I and II. It is also prevalent among civilians to some extent It may be acquired by direct transmission of the virus or by transfusion of blood from a donor who has had infectious hepatitis. In the latter case the disease is usually called homologous serum jaundice.

Acute infectious hepatitis is characterized by elevation of temperature, headache, abdominal discomfort and loss of appetite. After a short period, lasting from a few days to 2 or 3 weeks, jaundice may appear. Usually from 6 to 8 weeks are required for recovery. If sufficient time for rest and treatment is not provided, a chronic condition such as cirrhosis may be the final outcome, [illegible] recover completely, however.

Dietary Treatment

In the acute stage of infectious hepatitis it may not be possible for the patient to consume much food because of pain and nausea, and intravenous food and fluids have to be substituted. As *soon as possible the patient should be* placed on a high protein, high caloric diet.

T[illegible] the liver. Barker *et al.*[1] report having successfully given 250 Gm. protein to [illegible] high in carbohydrate to provide calories and spare the protein for liver regeneration.

[1] Barker, M. H., Capps, R B, and Allen, F. W · J A M.A. 128·997, 1945.

Moderate Fat. It used to be thought that the diet had to be low in fat in order to prevent deposit in the liver, but so long as enough protein is ingested there seems to be no necessity to limit the fat. Its presence in the diet adds to its palatability and increases the total food intake. For the foods allowed or limited, and for menus for the above regimen, see those listed under cirrhosis.

Cirrhosis

Etiology. Cirrhosis is the final stage of liver injury. It may be due to chronic alcoholism, to diseases of the circulatory system, such as Banti's disease, or to chronic infectious hepatitis discussed in the paragraphs above.

It is thought that in chronic alcoholism, cirrhosis is due to deficiencies in food intake occurring over a long period of time. The individual may get as much as 1,500 to 2,500 calories daily from the alcohol he consumes, since 1 Gm of alcohol yields 7 calories. There is little desire for other food, and gross inadequacies in all food constituents result. This leads to fat stasis and eventual necrosis (death) of liver tissue and, finally, to replacement of liver cells by scar tissue. If the diet is changed to *supply the needed nutrients, regeneration* of the less-damaged liver tissue may take place, or at least further degeneration will be prevented

Symptoms. Besides jaundice and marked enlargement of the liver, there may be a low level of serum proteins and nutritional edema due to protein starvation In advanced cases, portal hypertension (increased blood pressure in the portal system) occurs, because the liver is so filled with scar tissue that circulation is impaired. This, in turn, *causes diffusion of fluids and salts from* the intestinal capillary bed into the peri-[illegible]

High Protein, High Carbohydrate, Moderate Fat Diet

Solid Diet

Meals	Food	Amount Allowed	Gm	Protein Gm	Fat Gm	Carbohydrate Gm	Calories
Breakfast	Fruit, 15%*	½ c.	100	1		15	64
	Cereal, cooked	¾ c	130	1		12	59
	Eggs	2	100	13	12	1	162
	Toast	2 slices	46	4	2	24	126
	Butter or margarine	1 tablespoon	14		11		100
	Jam	1½ tablespoons	30			21	84
	Milk	½ c	120	4	5	6	81
	Cream, 20%	2 ozs	60	2	12	2	120
	Coffee						
	Sugar	1 tablespoon	12			12	48
				25	42	93	844
10 A.M	Fruit juice with	1 glass	240	2		26	108
	lactose	2 tablespoons	16			16	64
				2		42	172
Lunch	Meat, fish or fowl†	Large serving	120	28	16		250
	Vegetable, 3%*	1 serving	100	1		3	16
	Vegetable, 9%	1 serving	100	2		9	44
	Vegetable, 18%	1 serving	100	2		18	80
	Bread	2 slices	46	4	2	24	126
	Butter or margarine	1 tablespoon	14		11		100
	Milk	1 glass	240	9	10	12	166
	Custard	1 serving	100	5	5	11	114
				51	44	77	896
3 P M	Fruit juice with	1 glass	240	2		26	108
	lactose	2 tablespoons	16			16	64
				2		42	172
Supper	As for lunch			51	44	77	896
8 P M	Milk	1 glass	240	9	10	12	166
				9	10	12	
		Total		140	140	343	3,246

* It will be noted that the fruit and the vegetables in this diet menu are chosen according to the classification based on Carbohydrate Content which appears in Table 8, Part Four

† Calculation based on the composition of round steak, pork (lean) chicken and haddock as found in Table 1, Part Four

To make this diet low in sodium, cook all food without salt and limit eggs to one a day, meat to 1 3-oz serving (90 Gm) and milk to 600 cc [illegible]

have shown that fat, which formerly was thought to be injurious in liver disease, may be consumed in reasonable amounts, from 100 to 150 Gm or even more, without any deleterious effects The fat was shown to make the diet more palatable, and in this way the patient was encouraged to eat more food and more calories, which are essential in this disease. It should be pointed out, however, that the fats included in these experimental diets were mostly those [illegible]

High Vitamin. Because the previous diet has been grossly inadequate in vitamins as in all other nutrients, foods high in vitamins must be included liber-

HIGH PROTEIN, HIGH CARBOHYDRATE, MODERATE FAT DIET*
Semiliquid Form

MEALS	FOOD ITEMS	AMOUNT ALLOWED	Gm	PROTEIN Gm.	FAT Gm.	CARBO-HYDRATE Gm.	CALORIES
Breakfast	Orange juice with lactose	1 glass	240	2		26	108
		2 tablespoons	16		.	16	64
	Farina, cooked	⅝ c	130	1	.	12	59
	Milk	½ c.	120	4	5	6	81
	Cream	2 ozs.	60	2	12	2	120
	Coffee				..	..	..
	Sugar	1 tablespoon	12			12	48
				9	17	74	480
10 A.M.	High protein milk†	1 glass	240	24	7	36	300
Lunch	Cream of celery soup	1 serving	150	4	7	11	120
	Eggs, poached	2	100	13	12	1	162
	Mashed potatoes	1 serving	100	2	6	16	123
	Puréed spinach	1 serving	100	3	1	4	26
	Milk	1 glass	240	9	10	12	166
	Puréed dried apricots	1 serving	100	2	.	32	123
				33	36	76	720
3 P.M.	High protein milk†	1 glass	240	24	7	36	300
Supper	Orange juice with lactose	1 glass	240	2	.	26	108
		2 tablespoons	16			16	64
	Farina, cooked	⅝ c.	130	1	.	12	59
	Milk	½ c.	120	4	5	6	81
	Cream, 20%	2 ozs	60	2	12	2	120
	Sugar	1 tablespoon	12			12	48
	Baked custard	1 serving	100	5	5	11	114
				14	22	85	594
8 P.M.	High protein milk†	1 glass	240	24	7	36	300
		Total		128	96	343	2,694

* All calculations based on Table 1, Part Four.
† See Chapter 50 for recipe
To make this diet moderately low in sodium, cook all food without salt and substitute Protinal feedings (Chap 50) or other low sodium, high protein beverage in place of the high protein milk feedings

High Carbohydrate. It was found experimentally in animals, and has since been shown clinically in man, that a high carbohydrate diet is well tolerated in liver disease and seems to aid in recovery. This is probably due to its protein-sparing action. A diet containing from 300 to 350 Gm. of carbohydrate is recommended. This should include breads and cereals, potatoes, nongaseous vegetables, fruits, fruit juices, which may be fortified with lactose, jams, jellies, honey, sugar and plain hard candies

Moderate Fat. Experiments by Patek,[2] Hoagland[3] and their associates

[2] Patek, A. J, and Post, J.. J. Clin. Investigation 20.481, 1941.
[3] Hoagland, C. L, *et al.*: Am. J. Pub. Health 36 1287, 1946

the blood proteins may also produce ammonia, which is absorbed and carried to the liver.

Normally, the ammonia content of the blood is extremely low Even a small rise, induced by an accumulation of ammonia in the liver, will produce serious neurologic symptoms, beginning with drowsiness and lethargy, and ending in coma Other symptoms are "liver breath," a flapping tremor of the hands when the arms are extended, and sometimes disorientation The condition may occur in either infectious hepatitis or in cirrhosis [6]

The dietary treatment consists of a 30 to 50 Gm protein diet to limit the amount of protein to be deaminized and so limit ammonia formation.[7] It should be as high in calories as possible in order that no tissue protein will be broken [illegible]

out relapsing into coma. A low protein diet will be found in Chapter 28.

DISEASE OF THE GALLBLADDER

Disease of the gallbladder may be due either to infection or the presence of gallstones. In either case, there is a great deal of pain when fat is ingested. At the beginning of this chapter we discussed the mechanism by which the presence of fat in the duodenum stimulates the production of a hormone—cholecystokinin—which, when it is carried by the bloodstream to the gallbladder, causes it to contract and release bile It can be seen readily that a meal containing much fatty food may bring on an acute attack of gallbladder pain [illegible]

heated fats are less well tolerated than uncooked fats, it is better to omit the former Foods such as milk, eggs and butter should be allowed in limited quantities in order to meet the requirements of the adequate diet (*See* below)

The milk and the egg may be used as such in the diet, or they may be incorporated in cooked foods such as plain cake or custard

[illegible]

ing operation until all inflammation in the surrounding tissues has subsided. Cholecystokinin stimulates the bile ducts as well as the gallbladder to contract, and pain from the area operated upon may still result on the ingestion of fat.

Other Considerations Patients with gallbladder disease often show a tendency to constipation The use of a diet plentiful in fruit and non-gas-forming vegetables (*see* Chap 23) and with

[6] Lambert, M · J. Am Dietet A 33 1005, 1957

[7] Schwartz, R, *et al* New England J. Med 251:685, 1954

Restrictions and Omissions on a Low Fat Diet

Foods Limited:	Foods Omitted:
Milk to 1 pint daily	Cream, cheese other than pot or cottage cheese
Eggs to 1 daily	All fried foods
Butter or margarine to ½ tablespoon daily	Salad oils
Lean meat, fish or fowl to 1 serving daily	All meat high in fat, such as pork, bacon, ham, goose, duck, fatty fish
	Pastry
	Nuts, olives, avocados

ally in the diet. Multivitamin supplements are also prescribed usually. Thiamine has been shown by some investigators to prevent fat deposits in the liver, so that large doses of the B complex vitamins may be given

Salt. When severe ascites and possibly general edema exist, it may be necessary to limit the salt intake. Davidson[4] has shown that a diet restricted to 200 mg. sodium proved beneficial to 18 out of 30 patients. All foods must be cooked without salt Because meat, milk and

sary in this diet Special low sodium milks and Protinal,* a protein supplement very low in sodium content, will aid in keeping the protein of the diet high while restricting the sodium. (*See* Chap. 27 for a 200-mg. sodium diet and Chap. 50 *for recipes of low sodium,* high protein beverages.)

Roughage. If esophageal varices are present and the diet contains much roughage, these varices may bleed and further complicate the disease. Foods to be omitted are raw fruits and vegetables, whole-grain breads and cereals, and meats high in connective tissue.

Alcohol is strictly prohibited.

Feeding Problem

One of the grave problems confronting the nurse is to persuade the *patient* with cirrhosis of the liver to eat, for his recovery rests almost entirely on his dietary intake. Often he is toxic and may be extremely discouraged and depressed. The high protein, high carbohydrate, *moderate fat semiliquid diet on* page 319 may best meet his needs at first. Sometimes these patients will toler-

[4] Davidson, [illegible]
1955.
* The National Drug Co.

at the usual hours. (A variety of such feedings will be found in Chap. 50) The feedings should be supplemented with small trays at regular meal hours. It is gratifying to find that after 2 to 4 weeks of such a regimen, the patient is notably better and may then relish a high protein, high caloric diet such as found on page 320.

Complications

Esophageal Varices. These may occur in the patient with advanced cirrhosis, as explained earlier in the chapter. If there is hemorrhage, a tube surrounded by a small balloon may be inserted into the esophagus. The balloon is inflated to apply pressure to the *bleeding area. The remainder of the* tube is passed into the stomach, and the patient must then be tube-fed One such tube feeding[5] consists of the following *

- 1,500 cc. milk
- 3 eggs
- 120 Gm. glucose
- 100 Gm. Protinal
- 200 Gm. ground liver (lightly broiled before being added)

These materials should be mixed in a mechanical blender and strained to ensure that no particles clog the tube This feeding supplies about *2,500* calories and 170 Gm. protein. The use of a low sodium milk will reduce the sodium content, and the substitution of skim milk for whole milk will lower the fat content (but also the calories). *See* Chapter 32 for other tube feedings.

Hepatic Coma. In severe liver failure, when the number of functioning liver cells is limited, the deamination

[5] Sengstaken, R W, and Blakemore, A. H Ann Surg 131.781, 1950.
* *See* Chapter 32 for the calculation of this tube feeding

with pancreatitis in a good nutritional state is a difficult one. The diet tends to be low in calories due to the fat restriction, and the patient's food intake is poor because of constant pain. Every effort should be made to give the patient the foods that he can tolerate, and in such quantity that his nutritional needs continue to be met.

STUDY QUESTIONS

1 How does the liver function in digestion? In the metabolism of foods? As an organ for storage? In detoxification?

2 Why is a high protein diet usually ordered in infectious hepatitis? What feeding problems may be encountered in the early stages of this disease?

3 Why is alcoholic cirrhosis considered a nutritional deficiency disease?

4 A patient is diagnosed as having cirrhosis of the liver with ascites The doctor orders a high protein, high carbohydrate, moderate fat diet for him Explain why such a diet has been ordered

5 Which foods are to be used in the above diet? Which ones avoided?

6. How can this diet be changed to make it low in salt yet keep it high in protein?

7 What is thought to be the cause of hepatic coma? Why may a low protein diet be beneficial?

8. Write a menu for a day that contains 40 Gm protein and is as high in carbohydrate as possible.

9 Why does a patient with gallbladder disease have pain on the ingestion of fat? Why may this pain persist for several months postoperatively?

10 [illegible]

which limited on a low fat diet?

12. Write a low fat general diet for a patient with gallbladder disease. Write a low fat soft diet for the same patient 3 days after operation.

13 When a low fat, low cholesterol diet is ordered, which foods should be avoided?

See Bibliography in Part Four for other pertinent material on the topics discussed in this chapter.

VERY LOW FAT, BLAND DIET IN 6 MEALS*

Breakfast	*Lunch*	*Dinner*
Stewed prunes Cream of Wheat Milk, whole, ½ glass Coffee, if tolerated Sugar	Cottage cheese Toast, slightly buttered, 2 slices Jelly or honey Applesauce Tea, sugar	Sliced chicken Baked potato Soft-cooked string beans Canned apricots Tea, sugar
10 A.M.	3 P.M.	8 P.M.
Toast, slightly buttered, 2 slices Jelly or honey Skim milk, 1 glass	Fruit juice with 2 tablespoons lactose Crackers	Crackers Jelly or honey Skim milk, 1 glass

* This diet will contain approximately 70 Gm. protein, 25 Gm. fat, 350 Gm. carbohydrate and 1,900 calories

added stewed fruit and stewed fruit juices should correct this condition. In many cases these patients are obese. If there is overweight, the low fat diet should limit the caloric intake somewhat, but sugar, desserts, candy and other foods high in carbohydrate may also have to be limited if weight loss is to be achieved.

Role of Cholesterol. Cholesterol is excreted normally in the bile, and it often forms part or all of the constituents [illegible]

the cholesterol content of the food intake. For cholesterol content of food see Table 4, Part Four

PANCREATITIS

Pancreatitis, or inflammation of the pancreas, may be related to earlier disease of the biliary system, although in [illegible]

tion of the pancreatic tissues, which may proceed to hemorrhagic pancreatitis and eventual necrosis. Pain is severe, and nausea and vomiting are common symptoms.

Dietary Treatment

The pancreas is stimulated to produce pancreatic juice by the presence of food and hydrochloric acid in the duodenum Likewise, fat in the duodenum stimulates the flow of bile. The dietary treatment of pancreatitis, therefore, consists of foods which will not call either of these mechanisms into action

In severe, acute pancreatitis the patient is fed nothing by mouth. In milder attacks small meals consisting largely of easily digested carbohydrate and protein may be given Fat should be limited to 25 Gm. or less per day (*see* above for sample menu). During remissions of the disease the patient should be maintained on a bland low fat diet. The Bland Diet in Chapter 23 may be made low in fat by substituting skim milk for whole milk, limiting butter or margarine to 1 *tablespoonful per day* and eggs to 1 a day; using only lean meats, fish and fowl; and omitting cream, creamed soups and sauces, and all cheeses except cottage cheese

Alcohol is absolutely prohibited, as it irritates the duodenum and may precipitate an attack.

The problem of keeping the patient

gens either directly or by the circulating blood Swelling or edema of the affected organ or tissue is often an important factor in the symptoms, for example, in lips, eyes and nasal passages, and in the cerebral tissues in allergic headache or migraine. Smooth-muscle spasm is also important, as in allergic diarrhea. the action may be combined with edema, as in bronchial asthma.

This chapter is chiefly concerned with food allergies, but it should be borne in mind that any allergy, if severe, may interfere with the nutrition of the individual due to the effect on appetite and thus the general health This is often the case with a child, whose growth and development may be retarded seriously In all cases the nutrients in the diet should be evaluated carefully, and every effort should be made to make the diet as adequate nutritionally and as attractive as possible

Foods and Allergy

Proteins are considered to be the most important factors in food allergy, even though foods which cause such allergic disturbances may vary widely in protein content Sensitivity to a food such as honey is explained as due to the associated protein in the pollen grains mixed in the honey, for it has been shown that very minute amounts of a given protein may cause allergic reaction

Among the common allergy-producing foods, particularly in children, are wheat, eggs, milk and oranges. Other common food allergens are fish, chocolate, tomatoes and strawberries. It has been found that members of the same botanic family may have a similar allergic effect Lemons and grapefruit are likely to cause a reaction if oranges are allergenic Likewise, if cabbage gives rise to an allergic reaction, so may broccoli, Brussels sprouts and cauliflower

Since some of the commonly allergenic foods are among those essential for good nutrition, to eliminate one or more of them from the diet may create serious nutritional problems unless effective substitutions can be made

Factors Affecting Allergic Manifestations

Whether or not an allergic disturb-

state. Conversely, the severity of an al-

search for the offending food or foods a difficult process

TESTS FOR ALLERGY

A careful history, which should include the patient's record of all foods eaten during the preceding 3 or 4 days, with reactions noted as they occurred, may be sufficient for an accurate diagnosis Friedenwald[1] states that "the best diagnostic tool in allergy is a careful history of events, conditions, and other factors relating to the present illness

finding of the offending agent."

Skin Tests. Numerous tests for the detection of allergy and its specific causative agents have been used by the medical profession, among the first being the skin tests known as the scratch, the patch and the intradermal As the names indicate, the solution containing the suspected offending substance is applied either to a scratched portion of the skin or to a certain patch of skin and then covered with cellophane for 2 to 4 days. By the intradermal test the solution is injected into the superficial layers of the skin

In the event that welts, wheals and redness develop from any of these tests,

[1] Friedenwald, V E: J. Allergy 23 420, 1952.

CHAPTER TWENTY-SIX

Allergy; Skin Diseases

ALLERGY AND ITS MANIFESTATIONS

Classification of Allergens

Allergy is a condition of hypersensi- [illegible]

be caused in one individual by one substance and in another by an entirely different substance

The offending items comprise a long list and include.

Inhalants, such as pollen, dusts and cosmetics.

Ingestants, such as foods and drugs.

Contactants, such as cosmetics, poison ivy and adhesive.

Infectants, such as bacteria, fungi and parasites.

Insect and snake bites.

Injectants, such as serums, vaccines and hormones.

Physical agents, such as heat, cold, sunlight and effort.

Authorities disagree as to the prevalence of allergy, but it is believed that possibly 10 per cent of the population show evidences of allergy to one or more substances during life

Manifestations. There are no typical symptoms, as in a communicable disease, partly because very different tissues of the body respond. Among the many symptoms are eczema, often of extreme nature, urticaria (hives), asthma, also sometimes very severe, redness and swelling of the eyes, running of the nose (as in hay fever), headache or migraine, and such gastro-intestinal disturbances as diarrhea and colic. The fact that so many of the allergic attacks are related to the skin and the mucous membrane regions is explained partly by the extensive surface areas exposed to contact with the irritating substances or aller-

condiments All the foods included in these diets are known to be unlikely to produce allergic reactions The fourth diet, consisting only of milk, tapioca and sugar, is used as a last resort.

The patient is placed on one of the test diets for a period of a week. If the symptoms do not abate, he is tried on another one of the diets for the same length of time. If, at the end of the last test diet, relief has not been obtained, it is evident that causes other than food should be sought as allergic agents.

If, on the other hand, the patient is relieved of his symptoms on any one of the elimination test diets, he is kept on this for another week. Other foods, first chosen from the related test diets and then from foods in general, are added one by one, with wheat, eggs and milk last, because these three foods have been found to be the most likely to produce allergy. If the patient shows allergic symptoms after the addition of any one food, that food may be suspected as the cause of the allergic disturbance and must be omitted from the diet

A typical day's menu based on each of the first 3 diets will be found on this page

TREATMENT OF ALLERGY

Once the causal foods have been identified by one or more of the preceding tests, three courses are open.

1. To desensitize the patient gradually to those foods,

2. To limit the patient to diets which do not include the irritating foods, or

3. To try a method that recently has been employed for patients with very severe manifestations of allergy, such as intractable eczema or asthma—the use of ACTH (adrenocorticotropic hormone)

TYPICAL MENUS BASED ON DIETS 1 TO 3

DIET No 1

Breakfast	*Dinner*	*Supper*
Grapefruit Boiled rice with maple syrup Tea with lemon and sugar	Lamb chops Spinach with lemon Sweet potato Rice bread or biscuit Stewed pear with sugar Tea with lemon and sugar	Grapefruit juice Lamb stew (lamb, carrots, rice) Rice bread or biscuits Gelatin with lemon juice, sugar and pear Tea with lemon and sugar

DIET No 2

Breakfast	*Dinner*	*Supper*
Stewed prunes Fried corn-meal mush Bacon Tea with sugar	Roast chicken Baked squash Asparagus Corn pone Pineapple, canned Tea with sugar	Sliced cold chicken Pickled beets Ry-Krisp Stewed apricots with sugar Tea with sugar

DIET No 3

Breakfast	*Dinner*	*Supper*
Grapefruit Fried potatoes Soybean muffins (without eggs) Tea with lemon and sugar	Roast beef Peas Glazed carrots (with Wesson oil) Lima-bean bread Tea with lemon and sugar	Bacon Stewed Lima beans (seasoned with bacon fat) Potato flour muffins Peach tapioca Tea with lemon and sugar

an allergic reaction is indicated. However, it has been observed that many foods may give a positive skin test without causing allergic symptoms.

Elimination Test Diets

Because food allergy is somewhat more difficult to demonstrate by means of skin tests than other forms of allergy, Rowe[2] finds the trial of elimination test diets to be more reliable (*see* below). As can be seen, they consist of a series of 3 diets, each containing a cereal or a starch, 1 or 2 meats, a small group of vegetables and fruits and seasonings and

[2] Rowe, A. H.: Elimination Diets and the Patient's Allergies, ed. 2, Philadelphia, Lea and Febiger, 1944

ELIMINATION DIETS

(Rowe, A H Elimination Diets and the Patient's Allergies, ed 2, Philadelphia, Lea & Febiger, 1944)

Diet 1	*Diet 2*	*Diet 3*	*Diet 4*
Rice Tapioca Rice biscuit Rice bread	Corn Rye Corn pone Corn-rye muffins Rye bread Ry-Krisp	Tapioca White potato Breads made of any combination of soy, Lima, potato starch and tapioca flours	Milk† Tapioca Cane sugar
Lettuce Chard Spinach Carrot Sweet potato or yam	Beets Squash Asparagus Artichoke	Tomato Carrot Lima beans String beans Peas	
Lamb	Chicken (no hens) Bacon	Beef Bacon	
Lemon Grapefruit Pears	Pineapple Peach Apricot Prune	Lemon Grapefruit Peach Apricot	
Cane sugar Sesame oil Olive oil* Salt Gelatin, plain or flavored with lime or lemon Maple syrup or syrup made with cane sugar flavored with maple Royal baking powder Baking soda Cream of tartar Vanilla extract Lemon extract	Cane or beet sugar Mazola Sesame oil Salt Gelatin, plain or flavored with pineapple Karo corn syrup White vinegar Royal baking powder Baking soda Cream of tartar Vanilla extract	Cane sugar Sesame oil Soybean oil Gelatin, plain or flavored with lime or lemon Salt Maple syrup or syrup made with cane sugar flavored with maple Royal baking powder Baking soda Cream of tartar Vanilla extract Lemon extract	

* Allergy to it may occur with or without allergy to olive pollen. Mazola may be used if corn allergy is not present.

† Milk should be taken up to 2 or 3 quarts a day Plain cottage cheese and cream may be used Tapioca cooked with milk and milk sugar may be taken.

aged foods, according to our labeling law, must have their contents listed This may be of help in determining whether or not the offending food is present.

For the nurse in the doctor's office, where most allergy patients are treated, a knowledge of the preparation and the composition of foods may be of the greatest assistance to the physician and the patient. The availability commercially of many prepared foods which formerly were made in the home has made us less aware of what such foods contain A good example is mayonnaise, now seldom prepared by the housewife. That it contains a small quantity of egg may well be overlooked, and that it may contain wheat or wheat gluten as a binder would not generally be known The nurse and the patient together should explore every possibility in food preparation or composition so that the offending food or foods are sure to be omitted from the diet.

The wheat-sensitive patient must learn that baker's rye bread contains some wheat flour, that practically all hot breads, griddle cakes, pastries and puddings are made chiefly or partly from wheat products, that bran and gluten are wheat derivatives. Thickened gravies and sauces are to be avoided unless the thickening agent is known Even meat dishes [illegible]

malted and cereal beverages must be avoided by the wheat-sensitive person

For a complete description of the omissions necessary in wheat sensitivity, see Chapter 24 under "Gluten-Free Diet" For the patient allergic to wheat only, the restrictions on rye flour and oatmeal do not apply, but the remaining material will prove helpful in ensuring that all wheat products are eliminated from the diet.

The egg-sensitive patient likewise must investigate carefully all commercial [illegible]

and in the preparation of foaming beverages, and that most desserts, especially cakes, puddings and ice cream, contain eggs

The milk-sensitive patient may find that he is able to use milk that has been boiled or dried, but if sensitive to all milk, he must avoid cheese, butter and margarine (to which dry milk solids usually are added for flavor), as well as all other foods containing even infinitesimal amounts of milk. Bread as purchased usually contains some milk, therefore, the homemade product is preferable

It is well to note here that so-called "soybean milk" is an excellent milk substitute It is made from soybeans, a vegetable protein of good biologic value and fortified with minerals Its nutritive value is almost equal to milk with the exception of the vitamin content

An excellent booklet, "Allergy Recipes," is available from the American Dietetic Association [3] It contains a number of recipes for wheat-, milk- and egg-free diets

SKIN DISEASES

The causes of skin diseases are many [illegible]

how and why have not been proved definitely.

That the health of the individual has [illegible] pected of being causal factors, and, while much research has been done,

[3] American Dietetic Association, 620 N. Michigan Avenue, Chicago 11, Ill Fifty cents

or cortisone. These hormones do not cure, but so long as the patient is kept on small maintenance doses the symptoms are greatly relieved

Desensitizing Treatment

Avoidance of allergy-causing foods is not always desirable. It is difficult, for example, to supply children with the necessary food for growth if wheat or milk is eliminated from their diet. Unless the patient is severely allergic, it may be wise to try to desensitize him to such valuable but for him irritating foods. This treatment, however, should follow a period of complete abstinence from the offending food. Fortunately, it may be possible to desensitize by mouth, and, beginning with doses so minute that they cause no reactions in the person being treated, gradually the amount is increased until ordinary food portions can be tolerated

To illustrate, one child sensitive to egg white was so desensitized over a period of 7 months by a dosage beginning with 1/1000 Gm dry or powdered egg white Another child could tolerate at first only such small amount of egg

[illegible]

his diet.

Often adults may desensitize themselves successfully. A man acutely but

[illegible]

creasing number of drops of cream until he can resume the use of both cream and milk in his diet.

Restricted Diet Treatment

The chief means of treating the food-sensitive patient is to restrict the diet to the foods to which the patient is not allergic, and the best means of accomplishing this is to teach the patient as explained later in the chapter.

When the food responsible for an allergic disturbance is an unusual one in the individual's diet, such as strawberries, he is likely to associate the attack with the related food and is able, therefore, to eliminate it from his diet.

When patients are sensitive to a common food such as wheat, eggs or milk, all of which appear in the diet in many

[illegible]

containing the allergen is overlooked. Allergy recipes will be found in Chapter 50.

When the diet is very restricted, it is essential that it be evaluated for its protein, calorie, mineral and vitamin con-

[illegible]

of the adequacy of all nutrients in the diet except calories For instance, if all citrus fruits must be omitted, there is little likelihood that the diet will be adequate in ascorbic acid. Similarly, if milk and cheese must be omitted, the calcium content of the diet is sure to be too low for the patient's needs In such instances, it is important to stress those foods in the diet which are fair sources of the inadequate nutrient and, if necessary, to supplement the diet with mineral or vitamin concentrates.

Similarly, it is important that the caloric content of the restricted diet be carefully evaluated, so that weight loss does not result unless this is desirable.

TEACHING THE PATIENT

The patient must be made food conscious of the allergen to which he is sensitive, for even minute quantities may produce attacks. He must beware of commercial products of whose composition he is not absolutely certain. This applies not only to the foods and the drinks purchased in the market, but to those served in restaurants and other eating places, for prepared foods are often mixtures of various products. Pack-

CHAPTER TWENTY-SEVE

Cardiovascular Disease

CARDIAC DISEASE

Cardiovascular diseases constitute the greatest public health problem of the present time More people die from this group of diseases than from any other one cause today The longer lifespan of our population, bringing with it an increase of degenerative diseases is responsible for this to some extent. Rheumatic fever, the cause of rheumatic heart disease, often went unrecognized and untreated 20 or more years ago We have, therefore, a large number of people with rheumatic heart disease, some of which might have been prevented Lastly, but perhaps the most important, obesity, which predisposes to certain types of heart disease, is all too prevalent in this country

Etiology of Heart Disease

Congenital heart disease is due to a defect in cardiac structure developed *in fetal life*. It may be so mild that it is not discovered until adulthood or even later, or it may be so severe as to be crippling from birth onward. Cardiac surgery has restored many patients w congenital heart disease to normal h However, there are some defects f which adequate surgery has not as y been devised These patients, therefo must live under the same restrictions other cardiacs

Rheumatic fever and rheuma heart disease occur largely in childr and in young adults Again it may be varying degrees of severity In sev rheumatic heart disease, patients a chronically ill and often underweig and they present many of the nutritio problems discussed in Chapter 17.

life.

Arteriosclerotic heart disease found among middle-aged and ol

more evidence seems to be needed in order to establish these theories as specific factors.

Vitamin Deficiencies

Many vitamin deficiencies are known to be accompanied by skin manifestations, such as thickening, cracking, eruptions and bleeding These have been described in Chapter 20. The treatment depends upon the correction of the deficiencies. Even when definite deficiencies may not be established, many dermatologists advise the use of high vitamin diets, often with vitamin supplementation.

Acne Vulgaris

Acne vulgaris is defined as "an inflammation of the sebaceous glands from retained secretions." It is common to oily skins and occurs most frequently on the face, the chest and the back. The condition occurs most commonly in adolescents and young adults, and seems to be associated with abnormal response to hormonal activity in maturing indi-

high in fat also has been suggested as a causative factor.

Cormia[4] found that chocolate and nuts aggravated the condition in some individuals He agrees, however, that probably the most important dietary aspect of treatment is to ensure that these adolescents have a highly nutritious diet adequate to meet their needs during this period of rapid physical development (*see* Chap. 14).

[4] Cormia, F. E: Am J. Nursing 57:198, 1957.

STUDY QUESTIONS

1. What are some common allergenic foods? Which of these are the most difficult to eliminate from the diet should they prove allergenic?
2. How can the nurse be of aid to the physician and the patient in interpreting the allergic patient's food history?
3. How may food allergies be detected when skin tests fail?
4. What is the danger when patients are kept on test diets such as elimination diets for long periods of time?
5. Plan a week's menu for a patient who must follow Rowe's Elimination Diet No. 3.
6. Name 3 foods in which wheat may be used as an ingredient and of which a patient on a wheat-free diet must be warned; 3 foods in which milk may be the "hidden" ingredient, 3 foods in which eggs are the "hidden" ingredient.
7. Look at the label of a package of margarine. Why must a patient on a milk-free diet omit this food?
8. How may an allergy diet be evaluated for nutritive content? If milk has to be eliminated, which food nutrient is likely to be inadequate? Which is likely to be low?
9. What substitute for milk is available and is nearly equal to milk in nutritive content?
10. Which foods may be substituted for wheat to retain the caloric value of the diet? Which nutrients are lost to the diet when enriched wheat bread and cereal cannot be used?
11. Which foods equal eggs for nutritive value and may be substituted for them?
12. How may a patient be desensitized to a food allergy?

See Bibliography in Part Four for other pertinent material on the topics discussed in this chapter.

CHAPTER TWENTY-SEVEN

Cardiovascular Diseases

CARDIAC DISEASE

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alent in this country

Etiology of Heart Disease

Congenital heart disease is due to a defect in cardiac structure developed in fetal life It may be so mild that it is not discovered until adulthood or even later, or it may be so severe as to be crippling from birth onward. Cardiac surgery has restored many patients with congenital heart disease to normal life. However, there are some defects for which adequate surgery has not as yet been devised These patients, therefore, must live under the same restrictions as other cardiacs.

Rheumatic fever and rheumatic heart disease occur largely in children and in young adults. Again it may be of varying degrees of severity In severe rheumatic heart disease, patients are chronically ill and often underweight, and they present many of the nutritional problems discussed in Chapter 17. In the past few years cardiac surgery on the valves of the heart, often affected in rheumatic heart disease, has restored some of these patients to a more active life.

[illegible]

ability of the heart to maintain its function determine the severity of cardiac disease. Many older persons have little, if any involvement of the blood vessels, and in such individuals both blood pressure and cardiac function are normal.

Atherosclerotic heart disease is due to the deposit of fatty plaques in the blood vessels. It is now recognized as a distinct disease entity. The possible causative factors are obscure and at present hotly debated. When the fat plaques occur in the coronary arteries which supply blood to the heart muscle itself, the danger is ever present of clot formation, of coronary artery occlusion and damage to the surrounding heart muscle from lack of oxygen.

Other causes of heart disease are inflammation and constriction of the pericardial sac surrounding the heart muscle, syphilis and many others. If the cardiac damage is severe, the treatment is the same as for other types of cardiac disease.

Functional heart disorders may be expressed by heart pains and by disturbances in the rate and the regularity

of functional heart disorders are infection (other than rheumatic fever), fatigue, nutritional deficiencies, especially of thiamine, excessive use of tobacco and alcohol, and, very commonly, psychoneurosis. All cardiac irregularities, however, should be thoroughly investigated before being ascribed to functional causes.

The Severity of Cardiac Involvement

Cardiac disease may be acute, as in

reserve The severity of cardiac disease depends on the degree to which the heart is damaged and the extent to which this interferes with its function

If damage is slight, and the heart is able

may have to omit strenuous activity but otherwise will be able to perform his daily tasks without discomfort.

Decompensation, or severe heart disease, is said to occur when the heart is unable to sustain adequate circulation of blood to the tissues. The blood flow to the lungs is slowed, and oxygen uptake and carbon dioxide excretion are inadequate. The patient suffers from shortness of breath and chest pain when he performs any sort of activity. As decompensation progresses, the liver may become enlarged and edema may appear in the dependent parts of the body and,

heart failure.

When patients are chronically ill with severe heart disease, their activities must be severely restricted, and they may even have to spend much of their time in bed so that the limited oxygen supply will be sufficient for whatever activity is allowed Drugs to strengthen the heart muscle are commonly prescribed. If edema is present, diuretic drugs to increase water excretion are usually given, and a diet restricted in salt must be followed.

Dietary Treatment

For patients with compensated heart disease, the diet is changed only slightly, the object being to supply an adequate diet but avoid additional burdens due to overeating. If, however, the patient is even slightly overweight, the caloric value of the diet should be reduced until the patient is somewhat underweight. Some doctors advise some reduction even in those who are not overweight. By reducing the weight the heart is freer in its movements and the metabolism is decreased, thus furnishing less stimulus to its activity.

The dietary principles for treatment of this type of disease are as follows·

1. The maintenance of a diet adequate for all nutritional needs Weight reduction if necessary (*See* Chap 21)

2 The avoidance of bulky meals to prevent distention of the stomach and constant pressure against the heart

3 The avoidance of such foods as members of the cabbage family, dried peas and beans. These ferment easily, may cause gas in the alimentary tract and result in pressure against the heart

4 The avoidance of any food known to the patient to be difficult to digest.

5 The avoidance of constipation and straining.

6 The avoidance or the sparing use of stimulants. Sometimes tea and coffee are limited

7. Salt restriction, if ordered by the doctor to prevent the development of edema The Moderately Low Sodium Diet (*see* p 337) is usually prescribed

Patients with severe decompensation or with heart failure are usually too ill to eat, the diet, therefore, is restricted very severely Only water and fruit juices may be allowed, usually in limited amounts, or the patient may be placed on a Karrell diet, which consists of 200 cc. (6 ozs) milk at 8 A.M., 12 NOON, 4 P.M and 8 P.M Later, cereal gruels, toast, soft-cooked eggs, mashed or baked potatoes, vegetable and fruit purées, gelatin, custard and ice cream may be added, leading up to a Soft, Low Sodium or Very Low Sodium Diet (*see* pp 338-340). No salt is used in cooking or served on the tray. The diet is best served in 5 or 6 meals to prevent fatigue in eating

Dietary Management of the Chronically Ill Cardiac Patient

either soft or general, with the principles and the modifications as follows

Calories. If the cardiac patient is overweight, it is essential that the caloric intake be diminished and that the patient lose weight This measure tends to reduce basal metabolism and thus the work of the heart (*see* Chap. 21 for low caloric diets)

many cardiacs, especially those suffering from rheumatic heart disease, are underweight and undernourished Although it may not be possible or desirable to have them gain weight, every effort should be made to make the diet nutritionally adequate in protein, minerals and vitamins (*see* Basic Dietary Pattern, Chap. 18).

Protein The protein of the cardiac diet should meet the normal standard of 1 Gm per Kg of body weight. The need of adequate protein for all body processes has been well established, and therapeutic diets should provide the necessary amounts unless contraindicated by the nature of the disease

Carbohydrate and Fat. When the caloric value of the diet must be reduced, the reduction should come from both carbohydrates and fats The carbohydrates, however, should be the chief source of energy, as they are more easily digested and leave the stomach more quickly than the fats, thus providing more room for the working heart For patients considerably below normal weight, it may be necessary to increase the intake of these foods in order to

pressure by the stomach on the heart. It may be desirable to divide the 3 regular meals so that a part of each is served 2 or 3 hours later. The cereal and the milk from breakfast and the dessert and part of the fluid from lunch and dinner may be served as between-meal nourishment. This lessens the amount of food in the stomach at any one time and may ensure greater comfort for the cardiac patient.

Salt and Water. If edema is or has been present, the diet is usually limited in salt. Fluids may be restricted also, although at present most doctors believe that if the salt is limited, edema will not occur or, if present, will disappear. The sodium of the salt (sodium chloride) is the water-holding mineral of the body fluids and is found abundantly in the blood and in the fluid spaces between the cells (interstitial space). Normally we ingest a good deal of sodium each day, some of it found in the food itself and most of it added as table salt or sodium chloride in cooking processes It is estimated that the average person consumes from 2 to 3 level teaspoons of salt per day, or about 8 to 15 Gm. This is

ham, salted crackers and salted butter are omitted and no salt is used at the table, the diet will contain approximately 2,000 to 3,000 mg of sodium.

In the decompensated or severely ill cardiac patient, there is impaired circulation which leads to increased venous pressure. This causes a stasis of sodium and fluids in the interstitial spaces and prevents their reabsorption into the blood With poor circulation the blood also may not reach the kidney as frequently as normally, and less excretion of sodium results. Together these two factors may cause retention of sodium and, therefore, water in the interstitial spaces. This is called edema. It usually occurs first in the dependent areas of the body farthest removed from the heart, notably the ankles. If the disease goes

put to bed, edema may shift to the sacral region.

By lowering the sodium in the diet, there will be a decrease in the quantity of sodium circulating in the blood. This will help to draw the sodium and, therefore, water from the interstitial spaces back into the blood stream, to be excreted eventually by the kidneys, relieving the edema. Even patients with mild cardiac disease are usually placed on some degree of sodium restriction in order to prevent the development of edema

Varieties of Low Sodium Diets

Terminology. There are many degrees of salt restriction, depending on the severity of the cardiac disease and the amount of edema present. The so-called salt poor, salt free or low sodium diets contain varying amounts of sodium, depending upon the content of the natural food and the amount of salt that may be added in the preparation or cooking. Formerly, these diets were known as *low salt (no salt added at the table)* or salt free (no salt used in cooking or at the table). Since it has been found that the retention of sodium is the chief causative factor in edema, the word *sodium* now appears more frequently in the terminology.

In the following pages a group of variously restricted sodium diets is given.

1. **Moderately Low Sodium Diet, 2,000 to 3,000 Mg. Sodium.** This diet is usually ordered for the patient who has only moderate heart damage It allows a limited amount of salt in cooking, although none is served on the tray or at the table All salted foods such as bacon, ham, salted crackers and salted butter must be omitted.

2. **Low Sodium Diet, 600 to 1,200 Mg. Sodium.** This diet is usually prescribed for cardiac patients with edema.

MODERATELY LOW SODIUM DIET*
(Contains 2,000–3,000 mg Sodium)

Follow the restrictions of the Low Sodium Diet (600–1,200 mg Sodium) with *the following additions*

Salt . . .	. . Half a level teaspoon of salt may be used in cooking or added to food each day. (Measure out, place in salt shaker, and use as desired)
Eggs . .	. May be increased to 2 a day if desired
Vegetables .	All fresh, frozen and canned vegetables (except sauerkraut and tomato juice cocktail) are permitted
Bread . .	Three slices of salted commercial bread are allowed. If more bread is desired, it must be unsalted
Miscellaneous .	. Candy, molasses and commercial syrups are permitted

All other restrictions on the Low Sodium Diet must be observed

* From the Department of Nutrition, The New York Hospital

Salt is eliminated both in cooking and at the table, and foods of low or moderately low sodium content are chosen

3 **Very Low Sodium Diet, 200 to 400 Mg. Sodium.** This diet may be prescribed for patients with congestive heart failure and severe edema and for patients with hypertension Only foods of relatively low sodium content are allowed Whole milk is replaced by low sodium or dialyzed milk The foods allowed and to be avoided on the 3 degrees of salt restriction and a menu for a day for the Low Sodium Diet will be found on pages 337 to 341. A menu for the Very Low Sodium Diet is included with the section on hypertension later in this chapter

Seasonings for a Salt-Restricted Diet. Many patients have a difficult time adjusting to the omission of salt from their food There are many seasonings and flavorings which will help to make the diet more palatable, and every effort should be made to incorporate these into the diet A wedge of lemon will increase the flavor of many meats and vegetables Sugar and minced parsley or mint will add variety to the vegetables The use of brown sugar and dried fruit with cereal will almost completely mask the lack of salt Other flavorings which may be used with good results are salt-free tomato juice, onions, if tolerated, sweet spices such as cinna-

serts such as puddings and ice cream. Fortunately, most spices contain only a minute amount of sodium and may be used freely See Table 5 in Part Four for sodium content of spices Exceptions are celery, onion and garlic salt, dried celery and parsley flakes, sodium glutamate,

come accustomed to reading the labels of all prepared products to see if salt has been added

The method of preparation may also affect the flavor of foods. Baking, broiling or roasting, as well as frying, will make many foods more palatable

sodium recipes).

Use of Salt Substitutes. A number of salt substitutes are available to patients on salt-restricted diets. One of these, labeled "seasoned," has a variety

pressure by the stomach on the heart. It may be desirable to divide the 3 regular meals so that a part of each is served 2 or 3 hours later The cereal and the milk from breakfast and the dessert and part of the fluid from lunch and dinner may be served as between-meal nourishment. This lessens the amount of food in the stomach at any one time and may ensure greater comfort for the cardiac patient.

Salt and Water. If edema is or has been present, the diet is usually limited in salt Fluids may be restricted also, although at present most doctors believe that if the salt is limited, edema will not occur or, if present, will disappear. The sodium of the salt (sodium chloride) is the water-holding mineral of the body fluids and is found abundantly in the blood and in the fluid spaces between the cells (interstitial space). Normally we ingest a good deal of sodium each day, some of it found in the food itself and most of it added as table salt or sodium chloride in cooking processes. It is estimated that the average person consumes from 2 to 3 level teaspoons of salt per day, or about 8 to 15 Gm This is [illegible] tion If all salty foods such as bacon, ham, salted crackers and salted butter are omitted and no salt is used at the table, the diet will contain approximately 2,000 to 3,000 mg. of sodium

In the decompensated or severely ill cardiac patient, there is impaired circulation which leads to increased venous pressure This causes a stasis of sodium and fluids in the interstitial spaces and prevents their reabsorption into the blood. With poor circulation the blood also may not reach the kidney as frequently as normally, and less excretion of sodium results Together these two factors may cause retention of sodium and, therefore, water in the interstitial spaces. This is called edema. It usually occurs first in the dependent areas of the body farthest removed from the heart, notably the ankles. If the disease goes untreated, edema will begin to develop in the legs and the thighs so long as the patient remains up and about. If he is put to bed, edema may shift to the sacral region.

By lowering the sodium in the diet, there will be a decrease in the quantity of sodium circulating in the blood. This will help to draw the sodium and, therefore, water from the interstitial spaces back into the blood stream, to be excreted eventually by the kidneys, relieving the edema. Even patients with mild cardiac disease are usually placed on some degree of sodium restriction in order to prevent the development of edema.

Varieties of Low Sodium Diets

Terminology. There are many degrees of salt restriction, depending on the severity of the cardiac disease and the amount of edema present. The so-called salt poor, salt free or low sodium diets contain varying amounts of sodium, depending upon the content of the natural food and the amount of salt that may be added in the preparation or cooking Formerly, these diets were known as low salt (no salt added at the table) or salt free (no salt used in cooking or at the table). Since it has been found that the retention of sodium is the chief causative factor in edema, the word *sodium* now appears more frequently in the terminology

In the following pages a group of [illegible] has only moderate heart damage. It allows a limited amount of salt in cooking, although none is served on the tray or at the table. All salted foods such as bacon, ham, salted crackers and salted butter must be omitted.

2. Low Sodium Diet, 600 to 1,200 Mg. Sodium. This diet is usually prescribed for cardiac patients with edema.

Foods To Be Avoided:

Milk	Cultured buttermilk, yoghurt
Cheese	All cheeses except unsalted pot or cottage cheese
Fats	Salted butter and margarine, salt pork and bacon fat, [illegible]
	[illegible] processed in brine. (Fresh and frozen fish fillets are usually processed with brine.) Shellfish
Soups	All canned and frozen soups containing salt, bouillon cubes and other commercial meat extractives; dehydrated soups
Vegetables	Frozen Lima beans, sauerkraut, vegetables preserved with salt. Canned vegetables and vegetable juices to which sodium or salt has been added
Bread	Bread, rolls, biscuits, muffins and crackers prepared with salt or soda, commercial mixes, salted matzoth; self-rising flour
Cereals	Dry, prepared cereals except those permitted under Foods Allowed
Desserts	All commercial cakes, puddings, flavored gelatin, mixes, sherbet, ice cream except as allowed. Any dessert made with salt, soda or baking powder except as allowed. Junket
Beverages	Fruit juices or fruitades to which salt or sodium benzoate has been added (Read labels.)
Condiments	Salt, celery, onion and garlic salt, monosodium glutamate, meat tenderizers containing sodium, commercial meat sauces, onion and parsley flakes, prepared mustard, ketchup, soya sauce, tomato paste
Miscellaneous	Baking powder, baking soda, pickles, olives, relishes, chewing tobacco, salted nuts, peanut butter, molasses, commercial syrups, pretzels, Fritos, potato chips and other snacks to which salt has been added, candy to which sodium benzoate has been added All medications containing sodium

of spices added and is very palatable. However, many salt substitutes contain potassium and may be contraindicated if there is kidney damage. The patient should consult his doctor before proceeding to use a salt substitute

Another warning for the patient on salt restriction is that he must omit such compounds as baking powder, baking soda and drugs containing sodium. Reading labels is important here also

(A recipe for low sodium baking powder

which the water is drawn being high in sodium or to the use of water softeners. The patient can obtain information about the sodium content of his city's water by contacting the department of health.

Low Sodium Diet*
(Contains 600–1,200 mg. Sodium)

Foods Allowed:

Milk	Limited to 2 cups (1 pint) of milk, skim milk or cream a day. Low sodium milk as desired
Cheese	Unsalted pot or cottage cheese
Fats	Sweet butter, unsalted margarine, oils, vegetable shortenings, lard and other unsalted animal fats; unsalted homemade salad dressings
Eggs	Limited to 1 a day
Meat, fish, fowl	Limited to 3 to 5 ozs. of fresh, unsalted frozen or unsalted canned meat, fish and fowl, with exceptions as noted under Foods To Be Avoided. Liver and heart may be included in the allowance.
Soups	Unsalted broths, unsalted soup with permitted vegetables and cereals; homemade cream soups made with milk allowance
Vegetables	All fresh, frozen and unsalted canned vegetables and vegetable juices except those listed under Foods To Be Avoided. Dried navy beans or soybeans, lentils and split peas One of the following vegetables which are high in sodium content may be included once a week: artichokes, beets, celery, kale, Swiss chard, spinach, frozen peas
Fruit	Any fruit or fruit juice, fresh, canned, dried or frozen
Bread	Unsalted bread and crackers, Passover plain or thin tea matzoth
Cereals and Italian pastes	Cooked cereals prepared without salt; Muffets, Puffed Rice, Puffed Wheat, Shredded Wheat; barley, rice, grits, tapioca, cornstarch, macaroni, spaghetti, noodles, all prepared without salt
Desserts	Not more than 1 serving of pudding or ice cream per [illegible] salt are permitted freely.
Beverages	Coffee, tea, Sanka and Postum, cocoa (except Dutch process). Fresh and frozen fruitades Carbonated beverages. Ginger ale
Condiments	Pepper and other spices, herbs, vanilla and other extracts, vinegar and lemon
Miscellaneous	Sugar, white and brown, honey, jams and jellies made without the addition of sodium benzoate, hard candy, maple syrup, cream of tartar; unsalted nuts; unsalted popcorn

* From the Department of Nutrition, The New York Hospital

Foods To Be Avoided:

Milk	Cultured buttermilk, yoghurt
Cheese	All cheeses except unsalted pot or cottage cheese
Fats	Salted butter and margarine; salt pork and bacon fat,
	processed in brine. (Fresh and frozen fish fillets are usually processed with brine.) Shellfish
Soups	All canned and frozen soups containing salt; bouillon cubes and other commercial meat extractives, dehydrated soups
Vegetables	Frozen Lima beans, sauerkraut, vegetables preserved with salt Canned vegetables and vegetable juices to which sodium or salt has been added
Bread	Bread, rolls, biscuits, muffins and crackers prepared with salt or soda; commercial mixes, salted matzoth, self-rising flour
Cereals	Dry, prepared cereals except those permitted under
Desserts	
	Junket
Beverages	Fruit juices or fruitades to which salt or sodium benzoate has been added. (Read labels)
Condiments	Salt, celery, onion and garlic salt; monosodium glutamate, meat tenderizers containing sodium, commercial meat sauces, onion and parsley flakes, prepared mustard, ketchup, soya sauce, tomato paste
Miscellaneous	Baking powder, baking soda, pickles, olives, relishes; chewing tobacco, salted nuts, peanut butter, molasses, commercial syrups, pretzels, Fritos, potato chips and other snacks to which salt has been added, candy to which sodium benzoate has been added All medications containing sodium

of spices added and is very palatable However, many salt substitutes contain potassium and may be contraindicated if there is kidney damage. The patient should consult his doctor before proceeding to use a salt substitute.

Another warning for the patient on salt restriction is that he must omit such compounds as baking powder, baking soda and drugs containing sodium. Reading labels is important here also. (A recipe for low sodium baking powder will be found in Chap 50.)

The drinking water in some areas

The patient can obtain information about the sodium content of his city's water by contacting the department of health.

VERY LOW SODIUM DIET*
(Contains 200–400 mg. Sodium)

Follow the restrictions on the Low Sodium Diet (600–1,200 mg. Sodium) with further restrictions as follows.

Milk	Only low sodium milk is allowed, at least 1 pint a day. Two ozs. of regular cream are permitted.
Soups	Only unsalted cream soups made from low sodium milk and allowed vegetables are permitted.
Vegetables	Omit vegetables high in sodium content: artichokes, beets, celery, kale, Swiss chard, spinach, frozen peas.
Desserts	Allow only fruit, fruit ice, gelatin made with fresh fruit juices, unsalted desserts made from low sodium milk
Beverages	Omit carbonated beverages and ginger ale.

All other restrictions on the Low Sodium Diet must be observed.

* From the Department of Nutrition, The New York Hospital

Teaching the Patient

A booklet, "Planning Low Sodium Meals," similar to Meal Planning and Exchange Lists for the diabetic patient (*see* Chap. 22) is available from the Nutrition Foundation, Inc., 99 Park Avenue, New York 16, New York. It lists foods which have approximately the same sodium as well as protein, fat and carbohydrate content and may be exchanged for each other. The diet as a whole is guided by the prescription of the doctor. The booklet also contains

They are:

Strict Sodium Restriction–500 mg. of sodium

Moderate Sodium Restriction–1,000 mg. of sodium

Mild Sodium Restriction–2,400 to 4,500 mg. of sodium

These booklets have been prepared and are sponsored by a group of interested public health agencies and, like "Planning Low Sodium Meals," are intended to help the patient achieve the level of sodium restriction his doctor wishes him to maintain. The booklets may be obtained from the Education Department of The American Heart Association, Inc., 44 East 23rd Street, New York 10, New York.

circumstances and his cultural background. Both the wife and the husband should be taught what is required if the husband is the patient. Since an older patient may live with a son or a daughter, whoever is the homemaker should receive instruction along with the patient.

Patients who do not have adequate

tients, in the habit of cooking with bacon or salt pork, Jewish patients, following their dietary laws of heavily salting their meats before cooking (koshering); Italian patients accustomed to the use of

MENU FOR A LOW SODIUM DIET
(Containing 600 Mg Sodium)

MEAL	FOOD	AMOUNT ALLOWED	Gm	SODIUM Mg	PROTEIN Gm	FAT Gm	CARBOHYDRATE Gm	CALORIES
Breakfast	Grapefruit	½ medium	100	1	1		10	40
	Unsalted oatmeal	1 serving	100	1	2	1	11	63
	Egg	1	54	65	6	6		77
	Unsalted bread	1 slice	23	7	2	1	12	63
	Unsalted butter	2 teaspoons	10	1		8		72
	Milk	½ glass	120	60	4	5	6	82
	Sugar	1 tablespoon	12				12	48
	Coffee	*1 pot*						
				135	15	21	51	445
Lunch	Unsalted spaghetti	½ c.	100	1	5	1	30	149
	with unsalted tomatoes	½ c.	100	3	1		4	19
	and unsalted ground beef	1 oz	30	21	7	6		83
	Unsalted asparagus	1 serving	75	2	2		3	20
	Lettuce	1 serving	50	7			2	7
	Unsalted French dressing	1 tablespoon	15			5	3	59
	Fresh pear	1 medium	100	2	1		16	63
	Unsalted bread	1 slice	23	7	2	1	12	63
	Unsalted butter	2 teaspoons	10	1		8		72
	Milk	1 glass	240	120	8	10	12	166
				164	26	31	82	701
Dinner	Unsalted roast lamb	3 ozs	90	81	22	17		247
	Unsalted parsley potato	1 small	100	3	2		19	83
	Unsalted carrots	1 serving	75	37	1	1	5	26
	Orange and apple salad	1 serving	100	1	1		14	52
	Unsalted mayonnaise	1 tablespoon	15	1		11		99
	Tapioca pudding	1 serving	100	100*	5	5	21	149
	Unsalted bread	1 slice	23	7	2	1	12	63
	Unsalted butter	1 tablespoon	14	1		11		100
	Milk	½ glass	120	60	4	5	6	82
				291	37	51	77	901
	Totals for the day			590	78	103	210	2,047

Protein, fat, carbohydrate and calorie figures from Table 1, Part Four
Sodium figures from Table 5, Part Four
* Approximate

tomato paste and cheese, Chinese and Japanese patients for whom soy sauce is a usual accompaniment of many of their foods—all will need special help in understanding their problems Again the nurse and the dietitian must work in close co-operation, sharing their observations so that not only will they give the patient the information that he needs but help in the adjustments he will have to make Chapter 11 will be found useful in learning cultural food patterns

VASCULAR DISEASES

Atherosclerosis

As was explained earlier in the chapter, atherosclerosis, or fatty infiltration of

the blood vessels, is now considered a distinct disease entity. It is accompanied by a rise in the blood levels of cholesterol and of large molecules, consisting of fat and protein, called lipoproteins. It is thought that the high levels of cholesterol and lipoproteins may represent altered fat metabolism and that they bear a direct relationship to the development of *atherosclerosis.*

Coronary occlusion, the occlusion of one of the arteries which provide blood to the heart muscle, may occur as a result of atherosclerosis The patient who has suffered a coronary occlusion, with the resulting damage to the heart muscle, may with appropriate treatment recover to a large degree without chronic cardiac impairment. When the coronary occlusion is severe, however, death may be instantaneous The disease attacks men in the prime of life and is a common cause of death in the middle years. It is therefore of the utmost importance that the cause and the prevention of atherosclerosis be discovered.

The etiology of atherosclerosis is ob-

mones are a protective factor. Diabetes may predispose to the early development of atherosclerosis, although the reason is unknown Heredity also seems to play a role, some families having a greater incidence of the disease than

vessels, which in turn may favor the laying down of fatty plaques.

Obesity and sedentary living undoubtedly have a share in the development of atherosclerosis Life insurance company statistics show a far greater incidence of coronary artery disease in the overweight individual than in those of normal weight It is possible that not only may decreased physical activity affect the development of overweight but it may directly influence blood flow and the laying down of fatty plaques in the blood vessels.

Perhaps the most controversial issue is the effect of fat intake on the development of atherosclerosis. The percentage of calories derived from fat in the American diet has increased considerably in the past 50 years.[1] This may *lead to an increase in the blood level* of liproproteins and cholesterol, and possibly stimulate the development of atherosclerosis. The type of fat has also been thought to be a factor. Animal fats such as butter, meat fats and egg fat, and hydrogenated vegetable fats, all of which contain a fair proportion of saturated fatty acids, increase the blood levels of cholesterol and lipoproteins. On the other hand, the vegetable oils such as corn, soybean and cottonseed oils, which contain a large percentage of unsaturated fatty acids, tend to lower the levels of cholesterol and lipopro-

effective agent in lowering the blood lipids. (*See* Chap. 3 for discussion and tables of content of essential fatty acids in food) It is interesting to note that lowering the cholesterol content of the diet has no effect on blood-cholesterol levels, probably because the body is able to synthesize this substance as needed[3]

Pyridoxine, or vitamin B_6, has also been implicated in the disease, since it is involved in the metabolism of fat. It has been suggested that atherosclerosis may be due to a pyridoxine deficiency, leading to changes in fat metabolism.[4] Excellent reviews of the present state of our knowledge of the etiology of athero-

[1] McCann, M. B, and Trulson, M. J Am. Dietet A 33.358, 1957

[2] Ahrens, E. H, Jr, *et al*: J.A.M.A. 164. 1905, 1957.

[3] Keys, A., *et al*: J Nutrition 59 39, 1956

[4] Schroeder, H. A: J. Chron Dis 2 28, 1955

A VERY LOW FAT, LOW CHOLESTEROL DIET*

Foods Allowed:

Milk ... rmilk, and

Chees

Fats ... vegetable

Eggs

Vegetables .... As desired, including potato. At least 3 to 4 servings a day, with generous servings of deep green or yellow vegetables to provide carotene for vitamin A

Fruits .... As desired. At least 2 servings, 1 citrus

Bread, cereals, Italian pastes .... 3 or more slices whole-grain or enriched bread plus a serving of cereal. Macaroni, spaghetti and noodles as desired Omit egg noodles

Desserts .... Fruit, gelatin, angel food cake, cereal puddings made from milk allowance, fruit ices

Beverages .... Skim milk, tea, coffee, carbonated beverages, cocoa made from skim milk

Miscellaneous .... Jelly, jam, marmalade, honey, molasses, syrup and sugar as desired

Foods To Be Avoided:

Milk

Chees

Fats

Eggs

Meats

Soups

Bread ... such as some types of pastry

Desserts .... All except those allowed

Miscellaneous ...... Fish liver oils, chocolate

* This diet will contain between 25 and 30 Gm fat and from 100 to 125 mg cholesterol If a lower cholesterol diet is wanted, substitute a serving of cottage cheese for 1 serving of meat, fish or fowl *See* Table 4, Part Four, for cholesterol content of foods.

sclerosis may be found in articles by Page[5] and van Itallie[6]

[5] Page, I. H, *et al* J.A.M.A. 164 2047, 1957.

[6] van Itallie, T. B. J. Am Dietet. A. 33 352, 1957.

Dietary Treatment

The prevention of atherosclerosis is made difficult by the fact that we do not know its cause Page[7] states:

[7] *Op. cit.*

The keypoints of nutritional common sense for better health generally, and most likely in regard to atherosclerosis specifically, consist of a balanced, varied diet which adjusts total calories to reach or maintain desirable weight, and which provides less fat, more protein from lean meat, fish, poultry and cereals, and a reasonable selection of fruits and vegetables as well as animal foods.

Stare[8] recommends a 2,200-calorie diet of which 30 per cent of the calories are derived from fat for individuals who may be susceptible to atherosclerosis by heredity, by obesity or by the detection of increased blood-cholesterol levels. A week's menus are included in his article.

The presence of atherosclerosis is usually not known until coronary occlusion occurs. During the acute stage of cardiac [illegible]

for this restriction and the foods allowed and to be avoided on these diets will be found earlier in the chapter.

After recovery from the acute attack, the physician may advise a low fat diet in the hope of preventing a recurrence. Morrison[9] reports a 56 per cent survival rate in postcoronary patients placed on a diet containing 25 Gm. fat and 75 mg. cholesterol, compared with a similar [illegible]

restricted on such a diet will be found on page 343. It will be seen that the diet will be low in calories because of the fat restriction but that otherwise it may be made adequate for normal nutritional needs.

HYPERTENSION

Hypertension may result from arteriosclerosis or kidney disease. It also occurs as a separate disease entity of unknown etiology. In most patients it is benign for many years, although eventually cardiac failure, cerebral hemorrhage or chronic kidney disease may follow. When hypertension occurs in young people, it is termed essential hypertension, and if this progresses rapidly to cardiac and kidney failure, it is known as malignant hypertension.

Recent work by Dahl[10] indicates that the salt intake of the individual may play a role in the development of hypertension. In a study of over 1,300 subjects, he found that less than 1 per cent of those who habitually had a low salt intake demonstrated hypertension, while among those ingesting an average amount of salt the incidence was 6 8 per cent, and among those with a high salt intake the number of individuals with hypertension rose to 10.5 per cent.

The following table presents the average blood pressure of men at varying ages Any pressure that is decidedly above or below these figures is considered abnormal.

Average Blood Pressure of Men (United States and Canada)

Age	Systolic	Diastolic	Pulse Pressure
20	120	80	40
25	122	81	41
30	123	82	41
35	124	83	41
40 ...	126	84	42
45	128	85	43
50	130	86	44
55	132	87	45
60	135	89	46

[illegible]

8 Stare, F. J., *et al.*: J.A.M.A. 164 1920, 1957.

9 Morrison, L. M.: J.A.M.A. 159 1425, 1955.

10 Dahl, L. K.: J Am. Dietet. A. 34.585, 1958.

without causing unpleasant or dangerous side effects.

Dietary Treatment

As in atherosclerosis, there is great difference of opinion in regard to the dietary treatment of hypertension and hypertensive diseases In an admirable review of the subject, Page[11] says· "In overweight hypertensive patients the total caloric intake should be reduced, and that marks about the only area in which agreement exists."

[illegible]

on a low caloric diet (*see* Chap 21) until his weight is at normal or just below normal levels for his height and build. After this, he should be kept on the required calories to maintain this weight.

If cardiac damage has resulted from the hypertensive disease, one of the

[11] Page, I H J.A.M A. 147:1311, 1951

VERY LOW SODIUM DIET FOR HYPERTENSION
(Contains Less Than 200 Mg of Sodium)

MEAL	FOODS	AMOUNT ALLOWED	Gm.	SODIUM* Mg	CALORIES†
Breakfast	Orange, sliced	1 medium	100	1	45
	Shredded wheat	1	30	2	100
	with low sodium milk	½ c	120	2 6	70
	Unsalted cinnamon toast	2 slices	46	14	126
	Unsalted butter	2 teaspoons	10	1	70
	Coffee				
	Cream, light	2 tablespoons	30	12	60
	Sugar	1 tablespoon	12		48
				32 6	519
Lunch	Unsalted roast chicken	1 serving	75	56	150
	Unsalted Lima beans, fresh	1 serving	75	1	72
	Unsalted eggplant, fried	1 serving	75	2	18
	with vegetable fat	1 tablespoon	15		135
	Head lettuce	1 serving	35	5	6
	with unsalted				
	French dressing	1 tablespoon	15		45
	Bread, unsalted	1 slice	23	7	63
	Unsalted butter	2 teaspoons	10	1	70
	Fruit jello (gelatin,				
	fruit juice, fruit)	1 serving	100	2	110
	Cocoa with low sodium milk	1 c	240	6.2	140
	Sugar	1 tablespoon	12		48
				80 2	857
Supper	Unsalted cottage cheese	2 ozs	60	12	57
	Tomatoes, sliced	1 medium	100	3	20
	Potato, baked	1 medium	100	3	100
	Bread, unsalted	1 slice	23	7	63
	Unsalted butter	2 teaspoons	10	1	70
	Grapes	1 serving	100	3	70
	Coffee				
	Cream, light	2 tablespoons	30	12	60
	Sugar	1 tablespoon	12		48
				41	488
		Totals for day		153 8	1,864

* Sodium figures from Table 5, Part Four
† Caloric values from Table 1, Part Four

diets low in sodium described earlier in this chapter is indicated For kidney involvement, see Chapter 28 for dietary treatment.

The Role of Sodium. Experimental and clinical evidence indicates that the rigid restriction of sodium in the diet results in a decided reduction in the blood pressure of hypertensive patients. By the use of the rice diet and other diets low in sodium, Kempner,[12] Grollman[13] and others[14] have presented evidence that many hypertensive patients have been helped by a drastic restriction in sodium

The Kempner[15] rice diet has been used in the treatment of both hypertensive vascular disease and kidney disease Kempner[16] has reported beneficial results in 138 of 213 patients treated. The diet consists of rice, fruit, fruit juices and sugar, and contains approximately 2,000 calories, 20 Gm of protein, 5 Gm. of fat and 460 Gm. of carbohydrate. It contains only 0 2 Gm or 200 milligrams (mg.) or less of sodium The fluid intake is limited to from 700 to 1,000 cc. of fruit juices, no water being allowed.

Kempner describes the diet as follows.

The average patient can eat 200 to 300 Gm or 6½ to 10 ozs. of rice daily, which will provide 700 to 1,050 calories.

plain water or fruit juices, without salt, milk or fat.

The diet is supplemented with vitamins and iron. See Chapter 50 for recipes permitted on this diet.

Very Low Sodium Diet. Grollman[17] says that "it is very probable that the incidental salt restriction is responsible for the results reported recently by Kempner " Grollman chose foods of very low sodium content, limiting the sodium in the diet to 200 mg. or less. The diet follows that described under the Very Low Sodium Diet (p. 340) but must be calculated for sodium content to ensure its remaining below 200 mg. per day (*See* p. 345 for sample diet and Table 5, Part Four, for Sodium Content of Foods.) The diet differs from the Moderate Sodium Restrictions in that only low sodium milks are allowed; meats, fish and fowl are chosen from those containing least sodium; no high sodium vegetables are permitted, and desserts are severely limited. The Very Low Sodium Diet is decidedly lacking in flavor. Much can be done, however, to make it less objectionable if due consideration is given to preparation, appearance and contrast in color and flavors, and to the use of garnishes as well as of the seasonings mentioned earlier in the chapter

Salt substitutes may be used, but these should be approved by the physician Salt substitutes containing potassium are contraindicated if there is kidney disease.

STUDY QUESTIONS

1 Why may the patient with cardiac disease develop edema?

2. Why will a diet restricted in salt aid in preventing or eliminating edema in the cardiac patient?

3. Make out a menu for a day for a

soft-cooked eggs, refined bread toast,

[12] Kempner, W: North Carolina M J 5,125, 273, 6 62, 117, 1944-1945.

[13] Grollman, Arthur, *et al* J A M.A. 129·533, 1945

[14] Watkin, D. M.: Am J. Med. 9 441, 1950.

[15] *Op cit*

[16] *Op. cit.*

[17] *Op. cit*

butter, custard and junket (within the

Which nutrients are likely to be low? How can some of these be made up?

5 Which foods must be omitted on all varieties of sodium-restricted diets?

6 Compare the restrictions between Moderately Low, Low and Very Low Sodium Diets

7 What are some dietary principles other than salt restriction which the cardiac patient should observe?

8 Which cooking ingredients and seasonings must a patient on a salt-poor diet be warned not to use?

9. Which seasonings, spices and condiments may be used to make a salt-poor diet more palatable?

10 What warning must be given a patient about the use of salt substitutes?

11. How may a patient obtain information about the sodium content of his city's drinking water?

12. What aids are available for teaching patients on sodium-restricted diets How should these be used?

13 What are some of the regional and cultural food patterns which may make it difficult for a patient to adhere to a sodium-restricted diet?

14. Make out a menu for a patient on a 1,500 calorie low sodium diet who must carry his lunch

15 Look at the tables in Chapter 3 dealing with the amounts of linoleic acid in various foods Which of these are "table fats"?

16 Make out a menu for a day for a very low fat, low cholesterol diet. Is it palatable?

17 Make out a menu for a day for a patient on a Kempner rice diet What are some of the problems that this diet raises?

See Bibliography in Part Four for other pertinent material on the topics discussed in this chapter.

diets low in sodium described earlier in this chapter is indicated. For kidney involvement, see Chapter 28 for dietary treatment.

The Role of Sodium. Experimental and clinical evidence indicates that the rigid restriction of sodium in the diet results in a decided reduction in the blood pressure of hypertensive patients. By the use of the rice diet and other diets low in sodium, Kempner,[12] Grollman[13] and others[14] have presented evidence that many hypertensive patients have been helped by a drastic restriction in sodium.

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The average patient can eat 200 to 300 Gm. or 6⅔ to 10 ozs of rice daily,

allowed, with the exception of dates, avocados and any dried or canned fruit or fruit derivatives to which substances other than sugar have been added. No salt is permitted. All fruit juices are allowed, but tomato or vegetable juices are not given Brown or white sugar may be used ad libitum. Any kind of rice is used. The rice is boiled or steamed in plain water or fruit juices, without salt, milk or fat.

The diet is supplemented with vitamins and iron. See Chapter 50 for recipes permitted on this diet.

Very Low Sodium Diet. Grollman[17] says that "it is very probable that the incidental salt restriction is responsible for the results reported recently by Kempner." Grollman chose foods of very low sodium content, limiting the sodium in the diet to 200 mg. or less The diet follows that described under the Very Low Sodium Diet (p. 340) but must be calculated for sodium content to ensure its remaining below 200 mg. per day. (*See* p 345 for sample diet and Table 5, Part Four, for Sodium Content of Foods.) The diet differs from the Moderate Sodium Restrictions in that only low sodium milks are allowed; meats, fish and fowl are chosen from those containing least sodium, no high sodium vegetables are permitted, and desserts are severely limited. The Very Low Sodium Diet is decidedly lacking in flavor. Much can be done, however, to make it less objectionable if due consideration is given to preparation, appearance and contrast in color and flavors, and to the use of garnishes as well as of the seasonings mentioned earlier in the chapter

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3. Make out a menu for a day for a

soft-cooked eggs, refined bread toast,

[12] Kempner, W: North Carolina M J 5.125, 273, 6.62, 117, 1944-1945.
[13] Grollman, Arthur, *et al* · J A M.A. 129.533, 1945.
[14] Watkin, D. M · Am. J. Med 9.441, 1950
[15] *Op. cit*
[16] *Op. cit.*
[17] *Op. cit*

anism may be affected, and substances normally not found in the urine, such as albumin, one of the proteins in the blood, may now be present. Conversely, substances cleared from the blood in the healthy kidney may now not be fully eliminated Two of these are urea and, in very severe disease, potassium They will be found in increased quantities in the blood For these reasons a urine analysis and a blood chemistry test are often determining factors in the diagnosis of kidney disease.

NEPHRITIS

Nephritis, known also as Bright's disease, is a general term used to denote disease of the kidney due to inflammation and resultant degenerative changes. Different parts of the nephron unit may be affected in varying degree. For example, most cases of nephritis show the principal injury in the glomeruli, but in some cases changes in the tubules may be more prominent

Etiology. Nephritis may follow a generalized infection such as scarlet fever or a hemolytic streptococcal infection of the throat. Since it is the glomeruli which are affected, this type of kidney damage is usually called glomerulonephritis Nephritis also may occur in long-standing degenerative changes in the blood vessels as a result of arteriosclerosis. This is known as nephrosclerosis. Glomerulonephritis occurs more commonly in the younger age groups, while nephrosclerosis is associated with middle and later life.

GLOMERULONEPHRITIS

Glomerulonephritis may be acute, subacute or chronic; and it may be complicated by edema or uremia, the latter being the result of the accumulation of protein waste products in the blood. Nephritis may be of short duration, as in the acute form, or of many years' duration, as in the chronic type. It is evident that no one type of diet is applicable to all kinds of nephritis.

Acute Glomerulonephritis

Etiology and Symptoms. Acute glomerulonephritis is characterized by inflammation of the kidney following some of the contagious diseases of childhood, such as scarlet fever and chicken-

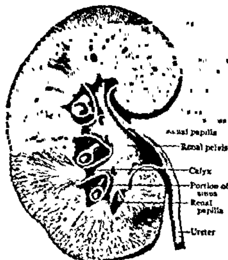


Fig 77 A section through a kidney showing the cortex more or less striated due to the parallel tubules which merge into the medullary rays sections or medullae. From the apex of each medulla (renal papilla) urine passes into the renal calyx, collects in the renal pelvis, and is finally eliminated through the ureter (Piersol, G. A. Human Anatomy, Philadelphia, Lippincott)

Functions of the Kidneys
Nephritis
Glomerulonephritis
Acute
Chronic
Nephrosclerosis
Uremia
Kidney Failure
Nephrosis
Kidney Stones

CHAPTER TWENTY-EIGHT

Diseases of the Kidney

FUNCTIONS OF THE KIDNEYS

The kidneys have been described as the "excretory servant of the body." [illegible]

ease by changing the concentration of substances excreted in the urine. Practically all the waste products resulting from metabolism, except carbon dioxide, are carried by the blood to the kidneys, where the blood is filtered and the waste products are eliminated

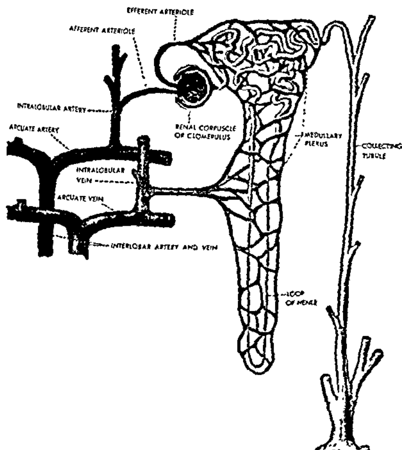
The kidneys are indeed a great filtering plant, provided as they are with about 2 million units called nephrons or renal units, each of which contributes its mite to the performance of this function The nephron consists of a tuft of capillaries—the glomerulus—surrounded by a covering or capsule which merges into a long winding tubule. The fluid which filters through the glomeruli is a protein-free filtrate of the blood plasma This passes through the tubules, where much of it is reabsorbed into the blood, the [illegible] it accumulates and in due time is eliminated from the body (*see* Fig. 77 and Plate 3).

Water is by far the chief constituent of the urine, the quantity varying mainly with the amount taken into the body and the amount excreted by means of the skin and the lungs. Normal urine contains only about 5 per cent of solids, consisting of salts, both basic and acid, and the end-products of protein metabolism, of which the largest constituent is urea.

The kidneys are subject to disease as are other organs of the body. Infection may occur, as in pyelonephritis, there may be inflammation, as in nephritis and nephrosis, or the kidney pathways may be blocked by the formation of kidney stones It is in the last two disease processes that diet is a factor in treatment

In kidney disease the filtering mech-

PLATE 3



A schematic drawing of the nephron, showing arterial and venous circulation. Water and water-soluble substances are filtered from the glomerular blood capillaries into the tubule. In the tubule, all of the glucose and much of the water, sodium and other components of the glomerular filtrate are reabsorbed into the surrounding capillary bed. The remainder passes from the collecting tubule into the pelvis of the kidney and finally by way of the ureters, into the bladder. (Sharp & Dohme's Seminar, vol. 9, No. [illegible] August, 1947.)

pox. It may also follow tonsillitis, sinusitis, pneumonia or influenza. It occurs more frequently in childhood or early adult life than in later years. It may be characterized by a diminished secretion of the urine, a condition known as oliguria; by nausea and vomiting; and by edema and hypertension. The urine is cloudy due to its content of albumin, casts and red and white blood cells. The disease usually is self-limiting, and complete recovery results. In a few cases the disease may go on to chronic glomerulonephritis.

Dietary Treatment

The aim in the treatment of such a condition is rest for the kidneys, disregarding, if necessary, for a few days the general nutrition of the patient.

Fluids should be limited to a little more than the output if oliguria is present. The total fluids usually are restricted to from 800 to 1,000 cc. Fruit juices and ginger ale may be substituted for water. As the oliguria diminishes the fluids are increased.

Salt. When edema is present the diet is restricted in salt. (*See* Low Sodium Diets, Chap. 27.)

[illegible]

the first 2 or 3 weeks, protein may be [illegible]

Chronic Glomerulonephritis

[illegible]

tion for obtaining life insurance. The urine is usually abundant in quantity and of low specific gravity, and it may show much or comparatively little albumin and few casts. There may be *morning headache*, and the patient may be annoyed by the necessity of frequent urination during the night, which indicates that the kidneys are having to work overtime to complete their task. As time goes on, these symptoms become more severe; polyuria develops, the blood pressure rises, and there is urea nitrogen retention in the blood, known as uremia. Edema, which is usually present, at [illegible]

of serum protein and a lowered osmotic pressure of the blood. Uremia, like coma in diabetes, is a very serious complication, the treatment for which is described later in this chapter.

Dietary Treatment

Protein. There are two schools of thought regarding the protein content of the diet in chronic glomerulonephritis. One group holds that the loss of serum protein in the form of albumin from the kidneys must be compensated for by a relatively high protein diet. For an adult with glomerulonephritis, these physicians prescribe 60 to 70 Gm. of protein per day for normal maintenance, plus a sufficient amount to make up for the loss of protein excreted in the urine. This may bring the protein intake up to 100 to 125 Gm. a day.

The second group believes that kidney healing is more likely to occur, or at least the progression of the disease is slowed down, by the use of a low protein diet. Clinicians favoring this regimen allow no more than 40 to 50 Gm. of protein per day. With the low protein diet care should be taken to include as much as possible of the complete proteins, such as milk, meat and eggs. These should be distributed throughout the 3 meals in

order to obtain the best possible utilization. Calories from carbohydrate and fat should be high to prevent breakdown of body protein for energy needs.

Salt. Salt is usually restricted, whether edema is present or not, in the belief that the restriction of sodium will spare the kidney work. The edema which is often present in nephritis is due to the lowered osmotic pressure of the blood, caused by the loss of serum albumin in the urine Lowering the salt in the diet decreases the sodium present in the blood and, it is hoped, will decrease the edema. That this is not always effective is probably due to a variety of causes, none of them clearly understood. For a variety of sodium-restricted diets see Chapter 27.

It should be noted also that salt substitutes that contain potassium, which may be permissible in cardiac disease, may be contraindicated in disease of the kidney. The kidney may not be able to eliminate potassium, and serious changes in electrolyte balance may result

Fluids. Water and other fluids are usually not restricted, as a good fluid intake is essential for the removal of waste products. Fluids may be increased if urea nitrogen retention is present to any degree

High Protein, Low Sodium Diet. Such a diet will be found on pages 319 and 320 in Chapter 25, noting the suggestions at the bottom of these pages for making the diet low in sodium See also Chapter 50 for recipes for high protein, low sodium beverages.

Low Protein, Low Sodium Diet. This will be found on page 352 It should be noted that this diet is low in calories, which may make it inadequate for the nutritional needs of many patients Suggestions for increasing the calories will be found at the bottom of the page

NEPHROSCLEROSIS

Nephrosclerosis occurs among older patients and is usually the result of arteriosclerosis and hypertension of long standing. (See Chap. 27.) The blood supply to the kidney has decreased gradually because of the thickening of the wall and the closing of the lumen of the blood vessels. Usually this is accompanied by increased blood pressure and is characterized by urea nitrogen retention in the blood. In the more severe cases, mild or moderate albuminuria also may be present.

Dietary Treatment

Calories. Many patients with arteriosclerosis and resulting kidney disease are overweight. If this is the case, the calories in the diet must be limited so that the patient will lose weight. (See Chap. 21 for low caloric diets) If the patient is of normal weight, the diet should provide the normal caloric value, depending upon the activity of the patient, usually from 2,200 to 2,500 calories for the adult male

Protein. If the urea nitrogen level of the blood is increased only slightly, the patient with nephrosclerosis may be allowed the normal amount of protein in the diet, so that his strength and vigor will be maintained When the blood urea nitrogen is elevated markedly, indicating inability of the kidney to excrete normal amounts of this waste product of protein metabolism, it becomes necessary to restrict the patient's protein intake to minimal levels, usually between 40 and 50 Gm. daily This must include as much of the complete protein foods as possible, and these should be distributed among the 3 meals to ensure adequate utilization. Such a diet will be found on page 352.

This diet contains only a little over 1,700 calories, possibly sufficient for the patient who needs to reduce his weight. For most patients, however, it will be too low for their energy needs, and additional nonprotein calories must be given in the form of sugar, jelly, fruit juice with added lactose and butter to increase the caloric value to the necessary level. Such an adequate caloric diet will

which help to make the low sodium diet more palatable and to the low sodium recipes in Chapter 50. Also, it needs again to be pointed out that patients with nephrosclerosis should not use salt

diets)

Fluids. Water and other fluids are usually given liberally in order to flush out urea and other waste products being retained, unless there is kidney failure with oliguria (scanty urine). In such cases, the amount of fluid given is closely correlated with the fluid loss not only from the kidneys but also from estimated losses from the skin and the lungs

UREMIA

All degrees of urea nitrogen retention in the blood are called uremia In the terminal stages of either glomerulonephritis or nephrosclerosis, uremia may be severe, indicating almost complete loss of kidney function The diet should be low in protein and salt, and fluids by mouth are adjusted to the output Limiting the potassium in the diet is not necessary unless kidney failure occurs. The patient is critically ill, however, and he may be able to take little,

sodium.

Should persistent vomiting occur, it may be treated by alternating dry foods

ale, hot tea or barley water with sugar or fruit juices.

KIDNEY FAILURE

Kidney failure may occur as the terminal stage of nephritis, or it may be due to hemorrhage or other temporary, although severe, restriction of blood flow to the kidney In kidney failure little if any urine is produced, and all the waste products are retained in the blood. If an artificial kidney is available, it may be used to filter the blood of its waste products If this is not possible, control by dietary treatment is indicated.

Dietary Treatment

must be entirely eliminated from the

The latter is particularly dangerous, as a

are given by Kolff[1] and appear on page 354. Hard candy may also be given. Such restriction in foods is difficult for the very ill patient, and the nurse and the dietitian must constantly reassure him about its necessity

As the kidney recovers its function, other foods very low in protein, sodium and potassium may be added, such as unsalted cooked rice, unsalted bread and

[1] Kolff, W. J.: Am. J. Med. 12.667, 1952.

LOW PROTEIN, LOW SODIUM DIET

MEAL	FOOD ITEMS	AMOUNT ALLOWED	Gm.	SODIUM Mg	PROTEIN Gm.	FAT Gm.	CARBOHYDRATE Gm.	CALORIES
Breakfast	Orange juice	½ glass	100	1	1	.	11	44
	Unsalted toast	1 slice	23	7	2	1	12	63
	Unsalted butter	2 teaspoons	10	1	.	8	.	72
	Unsalted oatmeal	1 serving	100		2	1	11	63
	Milk	½ glass	120	60	4	5	6	83
	Cream	4 tablespoons	60	24	2	12	2	122
	Sugar	1 tablespoon	12		.	.	12	48
	Coffee					.	.	
				93	11	27	54	495
Lunch	Unsalted omelet	1 egg	54	65	6	6	..	81
	Unsalted tomato, broiled	2 halves	100	3	1	..	4	20
	Potato, baked	1 small	100	3	2	..	23	93
	Apple and	1 small	90	.	..	..	14	54
	celery salad	1 stalk	10	10	.	.	1	4
	Unsalted mayonnaise	1 tablespoon	13			10		92
	Unsalted bread	1 slice	23	7	2	1	12	63
	Unsalted butter	1 tablespoon	14	1		11	..	100
	Milk	1 glass	240	120	8	10	12	166
				210	19	38	66	678
Supper	Unsalted pot roast	Small serving	45	32	12	10	.	139
	Unsalted carrots	1 serving	75	38	1	.	5	23
	Unsalted onions	1 serving	75	8	1	.	7	28
	Unsalted roast potatoes	1 serving	100	3	2		19	83
	Unsalted bread	1 slice	23	7	2	1	12	63
	Unsalted butter	2 tablespoons	10	1		8		72
	Grapefruit	½ medium	100	1	1	.	10	40
	Coffee				.	.	..	.
	Cream	2 tablespoons	30	12	1	6	1	60
	Sugar	1 tablespoon	12				12	48
				102	20	25	66	557
	Totals for the day			405	50	90	186	1,730

To increase the calories, fruit juices with lactose may be given between meals, and cream may be substituted for part of the milk without altering appreciably the protein or the sodium content.

' ' mit the

Sodium

prevent the breakdown of body protein for energy, which would add to the already accumulated end-products of protein metabolism in the blood.

Salt. Although edema seldom is present in the early stages of nephrosclerosis, salt often is restricted moderately to save the kidney work. If edema occurs, the salt should be limited as outlined above (*See also* salt-restricted diets in Chap. 27.) Attention is called again to foods and flavors listed in Chapter 27

MODERATELY LOW CALCIUM, LOW PHOSPHORUS DIET*

Foods Allowed:

Milk ....Limited to 1 cup (½ pint) a day. Cream may be substituted for part of the milk.
Cheese .... .Pot or cottage cheese only. Limited to 2 ozs
Fats ....As desired
Eggs ....Limited to 1 a day, egg whites as desired
Meat, fish, fowl ... ..Limited to 4 ozs. daily of beef, lamb, pork, veal, chicken,

Breads, cereals, Italian pastes

Desserts ... made with allowed milk and egg Angel food cake. (Do not use packaged mixes)
Beverages .. ..Coffee, Postum, Sanka, tea, ginger ale
Condiments ....Sugar, jellies, honey, salt, pepper, spices

Foods To Be Avoided:

Fruits ....Rhubarb
Breads, cereals, Italian pastes .. ..Whole-grain breads, cereals and crackers. Rye bread. All breads made with self-rising flour. Oatmeal, brown and wild rice. Bran, *Bran Flakes*, wheat germ. All dry cereals except those allowed
Desserts . ...All except those allowed

renal stone, J. Urol. 53 507, 1945)

ide, given by mouth, unites with the of soluble salts such as calcium chloride

BUTTER AND SUGAR MIXTURES FOR KIDNEY FAILURE

Frozen Butter and Sugar Pills

200 Gm. cane sugar 200 Gm. unsalted butter	Cream sugar and butter together, roll into small "pills," place in refrigerator until solid. 2,250 calories

Butter and Sugar Soup

200 Gm cane sugar 20 Gm flour 200 Gm unsalted butter 600 cc. water Coffee or rum extract	Mix sugar and flour together. Add enough water to make a paste. Add the melted butter. Cook 20 minutes in double boiler. Add remainder of water and flavor with coffee or rum extract. 2,300 calories

crackers, butter, sugar, a few vegetables, ginger ale, root beer and some other carbonated beverages, until the patient can again tolerate a diet which meets his nutritional needs. (*See* Tables 1 and 5, Part Four, for protein, sodium and potassium content of foods)

NEPHROSIS

True nephrosis is characterized by severe loss of serum albumin from the kidney, resulting in marked edema. It occurs only in young children and will be discussed in the chapter on children's diseases (Chap. 33).

The condition sometimes referred to as the nephrotic syndrome of nephritis is so called because of the massive al-

ages may be of value Recipes will be found in Chapter 50.

KIDNEY STONES

Etiology. *Kidney stones or urinary calculi*, varying in size from fine gritty particles to those which fill the pelvis of the kidney, sometimes form in either the kidney or the bladder. They may be caused by injury to epithelial cells lining

perparathyroidism, in which disease oversecretion of the parathyroid hormone causes loss of calcium from the bones, resulting in a high blood level of calcium with increased excretion of calcium in the urine.

Normally, the urine is slightly acid and, when it becomes alkaline, either from an excess of foods rich in alkaline minerals (*see* Acid-Base Balance, Chap. 6) or from infection, stones composed chiefly of calcium salts of oxalates, phosphates and carbonates may occur. On the other hand, uric acid and cystine stones develop in an abnormally acid urine.

Dietary Treatment

Calcium Phosphate Stones. The dietary treatment of kidney stones depends on the chemical composition of the stone. A successful method of treating calcium phosphate stones with an aluminum hydroxide gel and a moderately low calcium and low phosphorus diet has been reported by several inves-

operation, but they have a tendency to recur. The above regimen has prevented such recurrence. The aluminum hydrox-

[2] Shorr, E., and Carter, A. C.: J.A.M.A. 144 1549, 1950

[3] Spellman, R M, and Marshall, V. F.: J. Urol. 73.660, 1955.

CHAPTER TWENTY-NINE

Diseases of the Blood

Since the blood carries the products of digestion to all tissues of the body, distributes oxygen to the cells and removes waste products, its function is vital, and any abnormal condition of it immediately interferes with the work of the body as a whole. Under certain conditions the blood plasma may have a deficiency or an excess of certain dissolved materials, but that is dependent upon other conditions in the body and will be discussed elsewhere. The red and white corpuscles and the blood platelets are the factors usually affected in diseases of the blood-forming organs.

The erythrocytes or red cells in the blood, which normally number about 5,000,000 per cu. mm. in the male and about 4,500,000 per cu. mm. in the [illegible]

[illegible] body, food plays a very important part in supplying the necessary materials for blood building. Unfortunately, the dietary treatment of anemias is not so simple as it at first appears, because a variety of causes other than food deficiencies are responsible for most types of anemia, consequently, diet cannot be the only factor concerned in the treatment of these conditions.

ANEMIAS

Anemia may be defined as any clinical syndrome associated with a deficiency [illegible]

[illegible] mia and their treatment will be found in a recent article by Lichtman.[1] However, from the point of view of the strictly nutritional aspects, anemias may be classified into two types, those due to:

1. Loss of blood (hemorrhage)
2. Deficiency of certain substances essential to hemoglobin or red-cell formation.

ANEMIAS DUE TO LOSS OF BLOOD

After hemorrhage with consequent loss in blood volume, the quantity is first restored to normal by water taken from the tissues. The thirst which often accompanies hemorrhage is the body's

[1] Lichtman, H. C.: J.A.M.A. 167:735, 1958

adequacy. Foods Allowed and Foods To Be Avoided will be found on page 355.

Uric Acid Stones. Since uric acid is an end-product of purine metabolism, a low purine diet is recommended. This is discussed under Gout, Chapter 31.

Acid and Alkaline Ash Diets. The [illegible]

in the intestinal tract (most of the calcium and the iron) or in the urine. By changing the composition of the diet, the urine may be made either acid or alkaline. An acid urine may aid in dissolving alkaline stones and prevent their further formation. Likewise, an alkaline urine may affect acid stones in the same manner. Higgins[4] has successfully used this method in treating kidney stones

Most vegetables and fruits will yield an alkaline ash and, therefore, aid in the formation of an alkaline urine. Meats, fish, fowl, eggs and cereals will give an acid ash when metabolized and cause the urine to be acid Since much of the calcium of milk is re-excreted in the intestinal tract while the remainder of its [illegible]

acid and cystine stones, vegetables and fruits should predominate, while meat, eggs and cereals are somewhat restricted Conversely, on an acid ash diet, prescribed for calcium phosphate and calcium carbonate stones, meat, eggs and cereals are liberally included, and vegetables and fruits are restricted. A pint of milk is included on either diet. All foods should be in sufficient quan- [illegible]

tant that the patients maintain a liberal intake of fluids. This will tend to keep the urine dilute and prevent the precipitation of salts, which are the precursors of stone formation.

STUDY QUESTIONS

1. What are the functions of the kidney? Which diseases of the kidney may occur that interfere with these functions?
2. In which circumstances is protein usually restricted in the diet? What is the purpose of such restrictions? When may protein be increased? Why?
3. Why is salt usually limited in kidney disease?
4. Which flavors and seasonings will make a sodium-restricted diet more palatable?
5. Why are salt substitutes containing potassium usually not allowed in nephritis?
6. Make out a menu for a day for a high protein, low sodium diet, using some of the recipes given in Chapter 50.
7. Add 500 calories to the low protein, low sodium menu in this chapter without increasing the protein or salt content
8. Make out a menu for a day for a bland, low protein, low sodium semiliquid diet for a patient critically ill with nephrosclerosis and uremia.
9. Why are sugar-butter mixtures used as food in kidney failure? Can you think of some of the objections a patient might make to this regimen? How would you answer these?
10. Look at Table 5 giving sodium [illegible] account.
11. Make out a menu for a day for a patient who has been operated on for calcium phosphate kidney stone and has been placed on a moderately low calcium and phosphorus diet. Does it meet nutritional needs? Which nutrient is low?

[4] Higgins, C. C.: J. Urol 68 117, 1952.

See Bibliography in Part Four for other pertinent material on the topics discussed in this chapter.

iron and protein, to be at the top of the [illegible]

[illegible]

hemoglobin regeneration

Besides liver, which should be included at least once a week, lean meat, eggs, whole-grain and enriched bread and cereals and potatoes are common and good food sources of iron and, in the case of meat and eggs, of protein. Other foods valuable for iron content which [illegible]

[illegible] mon use, molasses. See the bar chart in Chapter 8 for iron content of common foods.

Medications. When it is necessary to restore the hemoglobin level promptly, iron medication as well as a diet high in protein and iron are indicated. Fortunately, most patients respond well to such a regimen.

Megaloblastic Anemia

Megaloblastic anemia is due to a deficiency of the vitamin folic acid (folacin). It is a macrocytic (large cell) type of anemia but differs in several respects from pernicious anemia. It occurs very occasionally in pregnancy and sometimes in sprue. The cause is thought to be either a grossly inadequate diet or a disorder in the absorption and the utilization of folic acid The anemia responds dramatically to therapy with folic acid. Infants born of mothers with this type of anemia may also develop the disorder. Treatment with folic acid effects a rapid response Of course, if the anemia is due to a poor food intake, it is essential that the diet be improved in all respects.

Pernicious Anemia

Pernicious anemia differs markedly from the anemias previously discussed in that it is characterized by deficient formation of red cells. As the disease progresses the number of red blood cells decreases, while the size increases. These large cells are called macrocytes. In contrast with the nutritional anemias, pernicious anemia is associated with a disorder of the bone marrow It is ac- [illegible]

[illegible] are formed in the red bone marrow and are not released into the blood stream until they reach a so-called mature stage, at which time they contain no nucleus In pernicious anemia, the cells do not mature normally and they are not released in sufficient numbers from the red bone marrow, which, therefore, becomes overcrowded with these immature cells.

The cause of pernicious anemia is thought to be the lack of a so-called intrinsic factor, a component of the gastric juice. This intrinsic factor is essential for the absorption of vitamin B_{12}, the antianemic factor which is stored in the liver until needed by the bone marrow for the maturation of red blood cells Liver and liver extract, long recognized as effective therapeutic agents in pernicious anemia, are potent sources of the antianemic factor. However, vitamin B_{12} has superseded the use of liver preparations. Both the anemia and the neurologic symptoms, if present, respond promptly to this substance.

During the first few days of treatment there is a marked increase in the number of immature red cells in the blood. These cells are called reticulocytes, because when they are stained the center appears as a mesh or network. After a few days this disappears, and the cells appear as normal erythrocytes. The cell count and hemoglobin continue to increase until the normal levels are reached, and these are maintained as long as therapy is continued. Appetite and digestion also improve.

mechanism for demanding an increased intake of water. If necessary, some of the blood volume may be restored by transfusion. The blood must then be improved in quality by the production of more red cells and hemoglobin In an otherwise normal individual recovery is spontaneous, but the red cells are replenished more rapidly than is hemoglobin The latter will be restored gradually, but the speed of its restoration seems to depend largely upon the diet of the individual The necessary food materials must be supplied in the diet in order that each of these red cells may contain the normal amount of hemoglobin

ANEMIAS DUE TO DEFICIENCIES

This group includes the anemias caused by two types of deficiencies.

1 Deficiency in substances necessary for hemoglobin formation, such as iron, protein, and folic acid. These are sometimes called secondary anemias.

2. Deficiency in substances necessary for red-cell formation and the release of these cells from the bone marrow.

Nutritional Anemias

Iron-deficiency anemias are most often encountered in infancy, in adolescence, in pregnancy and in diseases which interfere with the absorption or the utilization of iron

In Infancy. Normally the quantity of iron stored in the liver of the newborn infant is sufficient for blood building, even on the low iron diet of milk ingested for the first 2 to 3 months, although from then on foods containing iron should be included in the infant's diet. Anemia in infancy may be due to an inadequate prenatal storage of iron This deficiency may be caused by the inadequate intake of iron-rich foods by the mother during her pregnancy; by prematurity, when there has not been time enough to lay down a storage of iron; or by multiple births, when the maternal supply of iron, ordinarily adequate for one infant, may not have been sufficient for two or more.

Later in the first year of the infant's life, if a variety of foods has not been added to his diet, anemia may occur as a dietary deficiency disease.

In Adolescence. Anemia may occur in adolescent girls for a variety of reasons. It may be associated with excessive menstruation, not compensated for by an adequate dietary intake of iron. The

of nutritional anemia is far more prevalent among young women than is generally supposed, and is bound to interfere with health and vigor.

In Pregnancy. If the mother's diet is not rich in iron-containing foods, a temporary state of anemia may occur owing to withdrawal of body iron by the fetus. Adequate storage of iron in the fetus appears to depend largely on the amount of iron in the mother's diet. Anemia in either the mother or the infant will be prevented if care is taken to include a generous supply of the iron-rich foods in the diet

Lack of Absorption *In diseases* complicated by low gastric acidity, the iron in the diet may not be absorbed, because iron will remain in solution only in an acid medium Medications, both of hydrochloric acid and iron, often are necessary to keep the hemoglobin level at normal figures, although the diet should be investigated for possible inadequacies.

Dietary Treatment of Hemorrhagic and Nutritional Anemias

An increased supply of iron and protein is the important factor to stress in a diet which must be adequate also in all other dietary essentials Whipple[2] and his co-workers found liver, high in both

[2] Whipple, G. H, and Robscheit-Robbins, F. S.: Am J Physiol 72 408, 1925

iron and protein, to be at the top of the list of foods that promote blood regeneration Other investigators have shown experimentally that diets high in iron but inadequate in protein will not promote hemoglobin regeneration.

Besides liver, which should be included at least once a week, lean meat, eggs, whole-grain and enriched bread and cereals and potatoes are common and good food sources of iron and, in the case of meat and eggs, of protein. Other foods valuable for iron content which should appear frequently in the diet are kidney, heart, green, leafy vegetables, dried fruits such as apricots, prunes and figs, the legumes and, where it is in common use, molasses See the bar chart in Chapter 6 for iron content of common foods

Medications. When it is necessary to restore the hemoglobin level promptly, iron medication as well as a diet high in protein and iron are indicated. Fortunately, most patients respond well to such a regimen.

Megaloblastic Anemia

Megaloblastic anemia is due to a deficiency of the vitamin folic acid (folacin). It is a macrocytic (large cell) type of anemia but differs in several respects from pernicious anemia It occurs very occasionally in pregnancy and sometimes in sprue The cause is thought to be either a grossly inadequate diet or a disorder in the absorption and the utilization of folic acid. The anemia responds dramatically to therapy with folic acid Infants born of mothers with this type of anemia may also develop the disorder Treatment with folic acid effects a rapid response. Of course, if the anemia is due to a poor food intake, it is essential that the diet be improved in all respects.

Pernicious Anemia

Pernicious anemia differs markedly from the anemias previously discussed in that it is characterized by deficient formation of red cells. As the disease progresses the number of red blood cells decreases, while the size increases These large cells are called macrocytes. In contrast with the nutritional anemias, pernicious anemia is associated with a disorder of the bone marrow. It is accompanied by low gastric acidity Sometimes tingling of the hands or the feet occurs, indicating damage to the central nervous system. Normally, the red cells are formed in the red bone marrow and are not released into the blood stream until they reach a so-called mature stage, at which time they contain no nucleus In pernicious anemia, the cells do not mature normally and they are not released in sufficient numbers from the red bone marrow, which, therefore, becomes overcrowded with these immature cells.

The cause of pernicious anemia is thought to be the lack of a so-called intrinsic factor, a component of the gastric juice This intrinsic factor is essential for the absorption of vitamin B_{12}, the antianemic factor which is stored in the liver until needed by the bone marrow for the maturation of red blood cells Liver and liver extract, long recognized as effective therapeutic agents in pernicious anemia, are potent sources of the antianemic factor However, vitamin B_{12} has superseded the use of liver preparations. Both the anemia and the neurologic symptoms, if present, respond promptly to this substance.

During the first few days of treatment there is a marked increase in the number of immature red cells in the blood. These cells are called reticulocytes, because when they are stained the center appears as a mesh or network After a few days this disappears, and the cells appear as normal erythrocytes The cell count and hemoglobin continue to increase until the normal levels are reached, and these are maintained as long as therapy is continued. Appetite and digestion also improve.

Dietary Treatment of Macrocytic Anemia

A good supply of both protein and iron is as essential for this type of anemia as it is in the nutritional and the hemor- [illegible]

over, many patients with macrocytic anemias have a long history of a poor food intake. Therefore, the diet should be increased in vitamins and minerals in addition to iron and protein, and be adequate in calories.

DIETARY RECOMMENDATIONS FOR BLOOD DONORS

In the past 10 years it has become increasingly common for individuals to donate a pint of blood once or twice a year, or even more frequently, to be used for hospital or Red Cross blood banks. Although there are no harmful effects if this is not repeated too often, it is wise for such a person to adhere to a diet adequate in all nutritional respects and well supplied with iron and protein.

DISEASES AFFECTING THE WHITE BLOOD CELLS

Of the diseases affecting the white blood cells, leukemia is the most common As in all chronic diseases, it is important to maintain good nutrition. Often this is difficult because of the pa- [illegible]

painful. Therefore, food should be soft so as not to require much chewing. It should not be heavily salted or spiced; sharp fruit juices should be omitted, and such beverages as coffee and tea should not be given to the patient too hot. Milk and milk beverages, eggs, very tender meat, fish and poultry, mashed potatoes and strained vegetables and fruits such as are sold for infants are good and usually are well tolerated.

If ACTH (adrenocorticotropic hormone) or cortisone is used in treatment, the diet may have to be low in salt, as these hormones are known to increase sodium reabsorption in the kidney. (*See* Chap 27 for low-sodium diets.)

STUDY QUESTIONS

1. What are some of the causes of nutritional anemia?

2 Which food habits of some adolescent girls may lead to nutritional anemia? Which foods are likely to be omitted? (*See* Chap. 14.)

3. Which foods need to be increased in pregnancy to ensure that the mother will receive sufficient iron for her own needs and those of the fetus? (*See* Chap. 12.)

4. At what age should solid foods be added to the baby's diet? List some of these. Which of them are high in iron? (*See* Chap. 13.)

5. Which foods supply the largest amount of iron in the diet? Which common foods are good sources of iron?

6. Why is an adequate supply of protein as necessary as iron in the treatment of nutritional anemia?

7. Write a menu for a day containing 12 mg. of iron Do not use liver or other organ meats this day. Is it easy to obtain as much iron as this each day?

8. What is the function of vitamin B_{12} in pernicious anemia? How does this anemia differ from the nutritional anemias?

9. Plan a menu for a day for a patient with leukemia who has developed sore and bleeding gums, making it as adequate nutritionally and as attractive as possible.

See Bibliography in Part Four for other pertinent material on the topics discussed in this chapter.

CHAPTER THIRTY

Diseases of the Musculoskeletal and the Nervous Systems

DISEASES OF THE MUSCULOSKELETAL SYSTEM

Arthritis

Arthritis is an inflammatory process which involves the joints It may accompany an infection, but more commonly it is a disease entity The two major classifications are (1) rheumatoid or [illegible]

arthritis.

Rheumatoid arthritis occurs more frequently than osteoarthritis and usually starts in early adult life. Women are much more susceptible to it than men The cause of rheumatoid arthritis is unknown. It is a painful disease, accompanied by swelling and eventual deformity of the joints A few patients recover from the acute, initial attack, but in many patients the disease becomes chronic

Dietary Treatment

Many dietary regimens, such as the low carbohydrate diet and the low caloric diet, have been advocated A high dosage of vitamin D also has had its day, but after much trial and effort the consensus is that optimum nutrition in every respect is of the utmost importance

Patients with rheumatoid arthritis are frequently underweight and malnourished If they are in much pain, appetite may be lost. If they are very much crippled, particularly in the hands and the arms, eating may present a constant problem Food should be placed so that it can be reached easily. Plastic utensils, cups and glasses, light in weight, are handled more easily by the crippled person than heavier silverware and china Especially designed eating utensils such as those pictured on page 363 may prove helpful

As has been stated earlier, the diet should provide optimum nutrition. Milk,

Dietary Treatment of Macrocytic Anemia

A good supply of both protein and iron is as essential for this type of anemia as it is in the nutritional and the hemor- [illegible]

[illegible] over, many patients with macrocytic anemias have a long history of a poor food intake. Therefore, the diet should be increased in vitamins and minerals in addition to iron and protein, and be adequate in calories.

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Of the diseases affecting the white blood cells, leukemia is the most common. As in all chronic diseases, it is important to maintain good nutrition. Often this is difficult because of the pa- [illegible]

[illegible] painful. Therefore, food should be soft so as not to require much chewing. It [illegible]

[illegible] not be given to the patient too hot. Milk and milk beverages, eggs, very tender [illegible]

[illegible]

If ACTH (adrenocorticotropic hormone) or cortisone is used in treatment, the diet may have to be low in salt, as these hormones are known to increase sodium reabsorption in the kidney. (*See* Chap. 27 for low-sodium diets.)

STUDY QUESTIONS

1. What are some of the causes of nutritional anemia?
2. Which food habits of some adolescent girls may lead to nutritional anemia? Which foods are likely to be omitted? (*See* Chap 14.)
3. Which foods need to be increased in pregnancy to ensure that the mother will receive sufficient iron for her own needs and those of the fetus? (*See* Chap. 12.)
4. At what age should solid foods be added to the baby's diet? List some of these. Which of them are high in iron? (*See* Chap. 13.)
5. Which foods supply the largest amount of iron in the diet? Which common foods are good sources of iron?
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7. [illegible]
8. What is the function of vitamin B_{12} in pernicious anemia? How does this anemia differ from the nutritional anemias?
9. Plan a menu for a day for a patient with leukemia who has developed sore and bleeding gums, making it as adequate nutritionally and as attractive as possible.

See Bibliography in Part Four for other pertinent material on the topics discussed in this chapter.

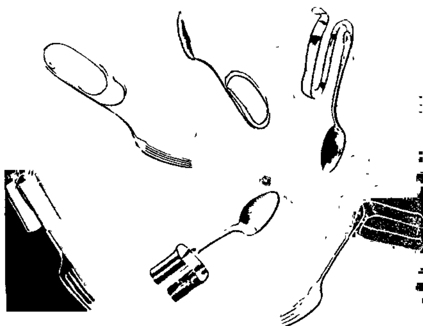


Fig 79 Self-help devices for use in eating Feeding utensils may be bent or shaped or have metal strips attached to fit the needs of an individual patient (The Institute of Physical Medicine and Rehabilitation, New York University—Bellevue Medical Center From Morrissey and Zimmerman Helps for the handicapped, Am J. Nursing 53 454, 1953)

Low sodium milk should be substituted for about half the regular milk intake each day Tender whole meats, fish and chicken may be permitted and whole vegetables of low fiber content substituted for the strained vegetables on the Convalescent Ulcer Diet. Coffee, tea and meat broths and gravies should be avoided, for they stimulate the flow of gastric juice more than most foods The use of spices, allowed on sodium-restricted diets, must be limited on this regimen

Osteo-arthritis usually occurs in persons beyond middle life and, like rheumatoid arthritis, is found more frequently in women than in men. It is a painful disease, and, although it does not cause the deformity of rheumatoid arthritis, the stiffness which the joints develop is very uncomfortable. It is thought to be a natural accompaniment of old age Corticotropin (ACTH) and cortisone are not recommended.[1]

These patients often present a healthy appearance, although they are usually

that the dietary treatment should be directed toward attaining a normal weight (*see* Chap 21)

Gout may produce a condition resembling arthritis which results some-

[1] Cecil, R. L., and Loeb, R. F Textbook of Medicine, ed. 9, Philadelphia, Saunders, 1955.

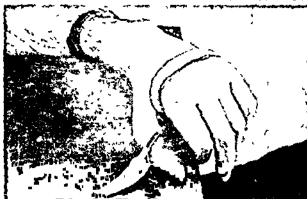




Fig. 78 Self-help devices for use in eating. When grasp is entirely absent, an elastic webbing cuff may be made to fit over the metacarpals of the hand. A leather strip that has been doubled and stitched to form a pocket is attached to the palmar side of the cuff. A spoon or a fork may be inserted into this pocket. (The Institute of Physical Medicine and Rehabilitation, New York University—Bellevue Medical Center. From Morrissey and Zimmerman: Helps for the handicapped, Am. J. Nursing 53 454, 1953)

eggs, meat, fish and chicken should be included in liberal amounts. Plenty of fruits and vegetables, and whole-grain and enriched bread and cereals will provide minerals and vitamins. Calories must be adequate and, if the patient is underweight, should be increased. The diet may be divided into 6 meals if the patient tires easily If the appetite is poor, it may be best to limit the between-meal feedings to a bedtime snack, preferably a milk drink

Medications. Two hormones—cortisone, similar to the hormones produced by the adrenal cortex, and corticotropin (ACTH), produced by the pituitary,

mones do not cure the disease is shown by the prompt return of symptoms when the medication is withdrawn. Therefore, the patient must continue to take small doses of one or the other hormone to remain comfortable.

Unfortunately, the continued use of these hormones may cause serious complications. Administered adrenal cortex hormones added to those normally produced by the body may lead to an increase in sodium reabsorption in the kidney and eventual edema. This calls for a diet restricted in sodium It has also been found that the long-continued use of these hormones increases the hydrochloric acid in the gastric juice and may lead to peptic ulcer. A diet to prevent both edema and the development of peptic ulcer would be a low sodium convalescent ulcer diet.

Applying the limitations of the Mild Sodium Restricted Diet on page 337 to the Convalescent Ulcer Diet on page 298, small amounts of salt would be

and Dilantin Sodium are the most effective means of controlling the seizures. In most instances this method of treatment has replaced other types of therapy. For some years the ketogenic diet was used widely in the treatment of epilepsy, especially for young children. [illegible]

are advised, along with the drug therapy of choice, to eat a diet that will supply them with all the requirements of normal nutrition for their age and activity.

Ketogenic Diet

Should a ketogenic diet be ordered, the following paragraphs give the characteristics of such a diet. In order to obtain a state of ketosis, the diet must be very high in fat, very low in carbohydrates and moderate to low in protein. In metabolism, all of the carbohydrate, a little over half the protein and 10 per cent of the fat are converted to glucose. The remainder of the fat and the protein will produce ketone acids as intermediary metabolic products These tend to accumulate in the body, producing a state of ketosis, which, if maintained continuously, may be effective in reducing epileptic seizures.

The ketogenic diet is difficult to follow, since the high fat, low carbohydrate intake does not lend much variety, and the large amounts of fat are often distasteful It is an expensive diet as well,

KETOGENIC DIET FOR A CHILD 7 TO 9 YEARS OF AGE
1,950 Calories, 40 Gm. Protein

Food	Calculation (Protein, 40 Gm., Fat, 189 Gm.; Carbohydrate, 20 Gm.)			
	Amount Gm	Protein Gm.	Fat Gm	Carbohydrate Gm.
Breakfast				
Fruit, 6%				
(or vegetable juice 100)	50	1		3
Cream, 40%	100	2	35	3
Butter or margarine	20		16	
1 egg	50	6	6	
Bacon with fat	20	2	13	
Bran soya muffin, 1	.	2	3	..
Dinner				
Roast beef (med. fat)	30	7	7	.
Vegetable, 3%	100	2		3
Fruit, 6%	50	1		3
Cream, 40%	50	1	18	1
Butter or margarine	25		20	.
Bran soya muffin, 1		2	3	.
Supper				
American cheese	30	8	10	1
Vegetable, 3%	100	2	.	3
Cream, 40%	100	2	35	3
Butter or margarine	25	.	20	.
Bran soya muffin, 1	.	2	3	
Total	.	40	189	20

times in a permanent deformity or a crippling of the joints. For further information see Chapter 31.

Muscular Dystrophy

Muscular dystrophy is a disease of the muscle fibers, causing progressive muscular weakness. It is accompanied by a defect in the metabolism of creatine. Large amounts are excreted in the urine, and the ability of the muscles to retain ingested creatine is impaired.[2] Because *deficiency of vitamin E in experimental* animals causes a disease similar to muscular dystrophy, it has been postulated that there may be a defect in the utilization of vitamin E by patients with this disease However, the administration of *vitamin E does not alter the course of* the disease.

Creatine Tolerance Test. This test was devised to evaluate the extent of muscle damage involved in muscular dystrophy The patient is given a known amount of creatine by mouth, and the urine is collected for a period of 3 to 5 days to determine how much of the ingested creatine has been excreted. In the normal person, much of the creatine would be retained by the body. In a patient with muscular dystrophy, the amount of creatine excreted in the urine above the control level indicates the extent of muscle involvement.

Creatine-Creatinine Free Diet. In order that foods which give rise to creatine in the body may not interfere with the test, a creatine-creatinine free diet is given for the period of the test. All meat, fish and fowl, as well as meat broths and gravies, are omitted. Gelatin, obtained from connective tissue, must not be given. Prunes, plums and cranberries are omitted, as they contain compounds which may be metabolized to creatine in the body. Commercial protein concentrates should not be given. Milk, eggs and cheese and all other foods in the normal adequate diet are allowed.

[2] Milhorat, A T, in Cecil, R. L, and Loeb, R F · Textbook of Medicine, ed 9, Philadelphia, Saunders, 1955

Collagen Diseases

A group of diseases involving the connective tissue of the body are grouped together under the name of collagen disease. Among these are lupus erythematosis, dermatomyositis, polyarteritis and scleroderma.[3] They are often treated [illegible]

[illegible]

ney, there may be an increase in such reabsorption when they are given as medication over and above the hormones that the adrenal cortex produces naturally. For this reason a low sodium diet may be ordered during the period of treatment. See Chapter 27 for varieties of low sodium diets.

DISEASES OF THE NERVOUS SYSTEM

Epilepsy

Epilepsy is a disorder which has afflicted mankind for many centuries. It is more often a disease of childhood and adolescence, but about one fourth of the known patients are adults.

Its chief symptom may be momentary loss of consciousness, called petit mal attacks, which may hardly be noticed, or the symptoms may be more severe, with accompanying convulsions. Contrary to popular belief, epilepsy does not cause mental deterioration except in a small percentage of cases. Most children can carry a normal level of schoolwork and some are far above average in intelligence. Both children and adults should be helped to lead lives as near normal as possible, as tension increases the number and the severity of seizures

Treatment

Various therapies have been tried in the treatment of this condition. At the present time such drugs as phenobarbital

[3] Cecil, R. L, and Loeb, R F: *Op cit.*

for the dietary treatment of constipation will be found in Chapter 24. Chapters 17, 18 and 20 will also be found helpful in the dietary care of this group of patients

STUDY QUESTIONS

1. Make out a menu for a high caloric diet for a patient with rheumatoid arthritis who has a poor appetite. Use "easy-to-eat" foods.

2. Make some suggestions for losing weight to a patient with osteoarthritis who is overweight and inactive because of the disease.

3. What type of eating utensils may be substituted for silver and china in the badly crippled arthritic patient?

4. Why may sodium have to be restricted in the diet when cortisone or ACTH is used?

5. What may happen to the quantity of gastric juice produced in a patient on long-term cortisone or ACTH therapy?

6. Write a day's menu for a patient on a moderately low sodium, convalescent gastric ulcer diet.

7. Which foods must be omitted on a creatine-creatinine free diet? Which foods may be given freely to maintain the protein in the diet?

8. What are the principles underlying the use of the ketogenic diet?

9. What types of diet have been advocated in treating Ménière's syndrome? Why?

10. What are some of the dietary problems encountered in mentally ill patients?

11. What nutritional problems are likely to occur among elderly and senile patients?

See Bibliography in Part Four for other pertinent material on the topics discussed in this chapter.

and calls for patience and co-operation on the part of the family and the patient if it is to be effective. The diet must be adhered to for a period of from one to several years

A sample diet for a child 7 to 9 years old may consist of 40 Gm. protein, 190 Gm. fat and 20 Gm. carbohydrate. The ratio of glucose to ketones produced in metabolism from such a diet is approximately 1 3, which is most likely to result in ketosis.

The diet must be calculated individually and should be weighed. Calories will probably be adequate, but vitamin supplements and some form of calcium and possibly iron should be added. A sample menu for this diet appears on page 365.

Ménière's Syndrome

Ménière's syndrome comprises a group of symptoms which include dizziness and gastro-intestinal disturbances associated with unilateral defects in hearing and in equilibrium. This syndrome is thought to be due to a swelling of the vestibular apparatus of the ear caused

Treatment

Dietary treatment is based on abstinence from foods to which the patient is sensitive or a low sodium acid ash diet and ammonium chloride as advocated by Furstenberg[4] (*See* Chaps. 27 and 28 for salt-restricted and acid-ash diets.) Some cases respond also to vitamin therapy. Atkinson[5] advises a high protein, high vitamin diet with the addition of niacin in the acid form, largely for its effect as a vasodilator. For elderly people he advises another factor of the B complex, thiamine, as it is milder in its effects on the blood vessels. Because Ménière's syndrome or disease is a vasospastic condition, he also states that smoking should be forbidden.

[4] Furstenberg, A C., *et al.*, Ann Otol, Rhin & Laryng 43 1035, 1934

[5] Atkinson, M · J A M A 116 1753, 1941.

Mental Illness

There is no specific diet therapy for mental illness. However, many problems of nutrition may occur in mentally ill patients. In the depressed patient, all interest in food may be lost, and patience and skill are necessary to encourage him to eat. The overactive patient may not be able to sit still long enough to eat. The delusional patient may project his fears and suspicions toward his food and, therefore, refuse it Again every effort must be made to maintain such patients in a good state of nutrition When it is not possible to persuade them to eat, it may become necessary to resort to tube feeding. Several varieties of these will be found in Chapter 32

Mentally ill patients undergoing insulin therapy do not need a therapeutic diet if their general state of nutrition is good The insulin which has been administered is counteracted at the end of each treatment by a large dose of glucose, either by mouth or by vein This brings the blood sugar back to normal levels and gives the remaining insulin the necessary sugar to metabolize. For details on the action of insulin in the body, see Chapter 22

Anorexia nervosa, typified by extreme underweight, is the manifestation of one form of mental illness. It has been discussed in Chapter 21

Bedridden patients, particularly the old and senile, should be watched to see that they eat sufficient food and a variety of foods. These patients will turn to the foods to which they have been long accustomed, such as bread, tea and perhaps soup, to the neglect of other, more nutritious, foods It is in this group of patients that nutritional deficiencies most often occur. If teeth are lacking, a soft diet rather than a general house diet is indicated. (*See* Chap. 18) In the old or the bedridden patient, there may be a tendency to constipation. Suggestions

toes should be included in the diet Cream may be substituted for part of the milk It is best to divide the food intake into 5 to 8 meals a day The patient may find it useful to carry crackers and a cube of cheese with him to control attacks

HYPERTHYROIDISM

Etiology Hyperthyroidism, as the name indicates, is a condition characterized by an excessive secretion of the thyroid gland It is known also as thyrotoxicosis, Graves's disease or Basedow's disease The chief symptoms are nervous irritability, fatigue, weakness, rapid pulse, loss of weight and a high basal metabolic rate The high metabolic rate, of course, accounts for the loss of weight, for it will be remembered that the thyroid gland through its internal secretion is probably the chief regulator of energy metabolism The rate of metabolism is increased from 15 to 20 per cent above normal in mild cases to 75 per cent or more in severe cases. When the metabolic rate is excessive, not only are the nutrients in the body burned too rapidly, but even the tissues are drawn upon as a source of additional fuel.

Drug Treatment

Treatment consists of suppression of the production of thyroxin by drugs or by radioactive iodine, or by excision of the gland

Dietary Treatment

It is important that extra food be given and that the patient rest to prevent unnecessary expenditure of energy When the metabolic rate is excessive, it may be necessary to increase the food intake to from 4,000 to 5,000 calories The high caloric diet (*see* Chap 21), therefore, is indicated until normal weight has been reached and the basal metabolic rate has returned to normal levels Since many of the vitamins, especially those of the B complex, function as parts of metabolic enzymes, it may be necessary to increase the vitamin content of the diet by the use of supplements to provide for the increased me-



Fig 80 Acute gouty arthritis of great toe (Cecil and Loeb: Textbook of Medicine, ed 8, Philadelphia, Saunders)

CHAPTER THIRTY-O

Miscellaneous Metaboli Disturbance

SPONTANEOUS HYPOGLYCEMIA

Etiology. Spontaneous hypoglycemia is not a clinical entity in itself but a disturbance of the carbohydrate metabolism which may be caused by a number of seemingly unrelated factors involving the liver, the pancreas and other organs of the endocrine system, as well as the nervous system One of the chief causes, however, is hyperinsulinism, or an overproduction of insulin by the pancreas. This may be a functional disturbance, or it may be due to a tumor of the pancreas.

Symptoms. The symptoms are almost identical to those produced by overdoses of insulin in the treatment of diabetes mellitus

Hypoglycemia, or low blood sugar, is accompanied by attacks of weakness, trembling and sweating which occur

the night. In severe cases there may be unconsciousness, convulsions and hysterical symptoms. This disease is characterized by extreme hunger—indeed, it is often known as the hunger disease. Abdominal discomfort, which is also characteristic, is relieved by taking food and, because of this similarity to pep ulcer, *it is sometimes mistaken for th* condition.

Dietary Treatment

A carefully planned and regulat dietary regimen is quite as important hyperinsulinism as in diabetes mellitu where hypoinsulinism is the causativ factor. The objective of treatment is supply the body with sources of gluco in as continuous a flow as possible bu to prevent a marked rise in the bloo sugar which stimulates the islet cells *produce insulin. For this reason the di* must be low in carbohydrate, while th more slowly digested and metabolize proteins and fats may be given abu dantly. The diet should contain fro 120 to 150 Gm protein, 150 to 20 Gm fat, sufficient to meet the calor needs, and not more than 50 to 75 Gm carbohydrate The carbohydrate shoul

used Fatty meats, bacon, eggs, the lov carbohydrate vegetables and fruits (*see* Table 3, Part Four), butter, mayonnaise and limited amounts of bread and pota-

due to increased formation of uric acid in the body, and not to an inability of the kidney to excrete this substance.

acid, and the use of a low purine diet.

Dietary Treatment

Since purine metabolism is disturbed, it is obvious that foods giving rise to purines should be used sparingly. All cellular tissues contain nucleoproteins from which purines are derived. Richest source of nucleoproteins are organ

but most physicians restrict their use.

Milk and eggs, having no cellular structure, contain no nucleoprotein and, therefore, are not a source of purines. They may be used freely in the diet

Plant foods giving rise to small amounts of purines are whole-grain breads and cereals, dried beans, peas and lentils, and asparagus, cauliflower and spinach The use of this group of foods should probably be somewhat restricted in the diet.

Fat is thought to prevent the excretion of uric acid from the kidney, and the diet, therefore, is usually low in fat. Calories may be made up by carbohydrate foods unless the patient is overweight, in which case the calories should be restricted

Gutman[1] advises a diet low in fat and virtually free of purines during an acute attack of gout Milk, cottage cheese and eggs are given in sufficient quantity to

[1] Gutman, A. B, and Yu, T F., J.A.M.A 157 1096, 1955.

MODERATELY LOW PURINE DIET

Milk	2 to 3 cups. Skim milk may be substituted if fat is limited.
Cheese	As desired. Use cottage cheese only if fat is limited.
Eggs	1 a day. (*See* note below.)
Fats	Butter and other fats as desired unless fat is limited.
Meat, fish, fowl*	2 to 3 ozs. 3 to 5 times a week, or daily if allowed Use
Vegetables	
Fruits	As desired. Use citrus fruit daily.
Bread, cereals and Italian pastes	Use white, enriched bread and cereals, macaroni, spaghetti and noodles as desired. Whole-grain breads and

gout, these should be omitted. Add 1 or 2 extra eggs.

tabolism. All stimulants such as coffee, tea, alcohol and tobacco are limited or omitted, depending on the doctor's orders.

HYPOTHYROIDISM

Hypothyroidism is marked by a deficient secretion of the thyroid gland. It is also known in its advanced stage as myxedema. It is characterized by a low metabolic rate, ranging from minus 15 per cent to minus 30 per cent or more, and may be said to be the antithesis of hyperthyroidism. Because of the low metabolic rate these patients gain weight rapidly. The treatment for this condition consists of medication in the form of [illegible] ciency. (*See* Chaps. 6 and 20)

GOUT

Etiology and Symptoms. Gout is a metabolic disorder, associated with altered purine metabolism. It is characterized by acute attacks of so-called gouty arthritis which may last for days or weeks, during which time certain joints, especially of the great toe and of the hands (*see* Figs. 80 and 81), become swollen and inflamed. Tophi, [illegible] appear entirely until another occurs.

The cause of the disturbance in purine metabolism is not known. Purines are formed in the breakdown of the nucleoproteins found in food. Purines, however, are also synthesized by the body's [illegible] to the kidneys for excretion in the urine. In gout the level of the blood uric acid is increased, and there are deposits of sodium urate crystals in and about the joints. Eventually there may be destruction of bone (*see* Fig 81) and permanent deformity. It is believed that the increased levels of blood uric acid are



Fig. 81. Bones of the hand of a normal person (*left*) and of one with far-advanced gout (*right*), showing marked skeletal changes. (The Department of Radiology, The New York Hospital)

CHAPTER THIRTY-TWO

Surgical Nutrition; Burns

PREOPERATIVE DIETS

The type of preoperative treatment given will depend upon the type of operation, whether minor or major, and the time interval before the operation [illegible]

one

The dietary treatment of the patient in preparation for an operation depends on his condition This is determined by physical examination and various clinical tests For so-called subclinical deficiencies a dietary history may prove to be of value The conditions that may have to be combated in diseases requiring major surgery are listed below

Symptoms Requiring Attention

1. **Loss of Weight, Strength and Recuperative Power.** Every effort should be made in such patients to increase the intake of nutritious and easily digestible foods, such as milk or milk and cream, eggs, fruit juices fortified with lactose, high protein beverages and as much other food as the patient can tolerate without discomfort

2. **Dehydration, or Loss of Body Fluids.** This condition may exist if there has been vomiting, diarrhea or loss of weight The remedy consists of filling up the reservoirs of the tissues with fluids—by mouth and by intravenous infusions. In dehydration there may also be loss of salts from the tissues Body chlorides are lost through vomiting, and sodium is then excreted via the kidney To remedy this condition sodium chloride may be given with glucose intravenously.

3. **Loss of Glycogen from the Body Stores: in the Liver and Muscular Tissues.** To correct this condition carbohydrates should be given abundantly. Fruit juices with added lactose and hard candies are excellent sources Glucose may be given intravenously.

4 **Hypoproteinemia, or Depletion of Serum Protein.** A high protein, high carbohydrate diet and transfusions of blood or plasma are given in preparation for surgery.

butter and other fats should be limited. When the patient has begun to recover, a moderate serving of meat, fish or fowl is added daily. The patient is kept on a moderately low purine diet to forestall further attacks if possible. See *page 371 for foods allowed on a low* purine diet.

TETANY

Etiology. Tetany, otherwise known as spasmophilia, is a term applied to a disturbance of muscular function characterized by convulsions or other muscular spasms. It occurs much more frequently in children than in adults, although it is not uncommon in pregnancy. Sometimes the cause is due to hypoparathyroidism It frequently occurs when some of the parathyroid glands have been removed by thyroidectomy, although there may be other causes, the exact nature of which is not always known. It is associated with disturbances of mineral metabolism, characterized usually by one of two abnormalities: (1) hypocalcemia (low blood calcium), or (2) alkalosis.

Hypocalcemia may be due not only to an endocrine disturbance but to a deficiency of the food intake or to a loss of calcium such as occurs in pregnancy, in osteomalacia and in fatty diarrhea. The food deficiency may be due to lack of calcium in the diet, to inability to absorb calcium or to a nonutilization of it, caused by vitamin D deficiency. The treatment, therefore, consists of large quantities of milk to provide calcium and such measures as will increase the absorption and the utilization of calcium, such as exposure to sunlight or ultraviolet light and the administration of vitamin D in the form of viosterol or *certain fish-liver oils. Calcium salts* also may be administered to increase this mineral in the blood.

Tetany due to alkalosis may be caused by an excessive intake of base-forming or alkaline compounds, such as *sodium bicarbonate, or by losses of the* acids such as hydrochloric acid occasioned by prolonged vomiting. When tetany occurs from alkalosis, the treatment consists of the administration of acid therapy such as hydrochloric acid and other measures which will restore the acid-base balance of the body.

STUDY QUESTIONS

1. Plan a day's menu for a patient with hyperinsulinism He is on a diet of 100 Gm. protein, 160 Gm. fat and 75 Gm. carbohydrate.

[illegible]

ordinary diet

4. A man weighing 150 lbs. has gout and is suffering from an acute attack.

a Plan an adequate menu *for a* day for him from the foods given under Moderately Low Purine Diet but omit meat, fish and fowl.

b Does this diet adequately meet all the patient's nutritional needs? (*See Chap. 1.*)

c Which foods should be avoided entirely on a low purine diet?

d. Change your menu to make it low in fat but add enough carbohydrate foods to keep the caloric value the same

5. What are the causes of tetany? How is it treated?

See Bibliography in Part Four for other pertinent material on the topics discussed in this chapter.

days preceding the operation in order to have the gastro-intestinal tract as clear of partially digested food as possible. Usually, no food or fluid is allowed after midnight of the day before operation.

POSTOPERATIVE DIETS

Specific Considerations

The state of nutrition of the patient following operation must be maintained, but, owing to the toxicity of the anesthetic, nausea is likely to occur. The

supplies this. Of even greater importance may be the need for protein, since it is essential for the healing of wounds. Blood transfusions to supply serum proteins as well as to counteract blood loss are a routine procedure immediately after major operations Protein hydrol-

is also important. The normal avenues of fluid intake by beverage, food and metabolism of food are greatly decreased *because of the inability to take anything* by mouth. The usual avenues of excretion continue and may even be increased by vomiting, hemorrhage and exudation. Therefore, the intravenous use of fluids is extremely important. Usually they are given immediately after the operation to prevent dehydration and shock.

Maintenance of salt balance is equally necessary. Salts may be lost by the same routes by which fluid is lost. The use of physiologic saline is indicated

given in one solution

Food by Mouth. Except in operations on the gastro-intestinal tract, the first thing given by mouth is water in

vomiting, other liquids, such as tea with sugar, ginger ale and broth, are added next.

From this stage the patient will progress to a full-liquid, a soft and, finally, a general house diet. (*See* Chap. 18) With the early ambulation for surgical patients in vogue at the present time, there is a much more rapid recovery from the postoperative state and, therefore, a rapid increase in the diet It is not uncommon for a patient to be on a general diet by the second postoperative day. The great advantage of this rapid progression in dietary intake is that there is little loss in the nutritional state of the patient and, therefore, more rapid recovery.

Complications. In patients in whom recovery from surgery is slowed for some reason, the problem of maintaining nutrition may become acute. Holden[1] has shown that both weight and tissue nitrogen losses occur very rapidly when postsurgical patients do not have a sufficient caloric intake Intravenous glucose and amino acids cannot be given in sufficient quantities to meet caloric and protein needs; consequently, body protein and fat are broken down For some years research has been carried on to perfect a

patient's caloric needs and prevent weight and tissue loss. Until such time, every effort must be made to increase the food intake by mouth. When it is not possible for the patient to eat all the food served to him, tube feedings may have to be resorted to (See end of this chapter)

[1] Holden, W. D , *et al*: Ann. Surg 14 563, 1957.

5. Edema or Retention of Body Fluid in the Tissues. If this is the result of a low level of serum proteins, it is treated as above. Cardiac edema will be treated with a sodium-restricted diet and appropriate diuretics and cardiac drugs.

6. Anemia. This frequently occurs when there are hemorrhagic lesions. Foods high in iron may be given, but time seldom permits the restoration of hemoglobin by this means of therapy. Usually, blood transfusions are given to these patients.

7. Vitamin-Deficiency States. These may occur for varying reasons. In patients who have had a nutritionally inadequate diet, either because of inability to eat or because such a diet was unobtainable, vitamin supplements accompanying as nutritive a diet as the patient can tolerate will do much to correct the condition Such patients may show some of the other failures of nutrition, such as low serum protein levels and anemia, mentioned above.

Patients with liver or gallbladder disturbances may have had difficulty in the absorption of vitamin K, a fat-soluble vitamin which needs bile salts for absorption. This vitamin may be given by injection if hypoprothrombinemia is present.

As ascorbic acid is essential for wound healing, it may be given as a prophylactic measure by mouth or intravenously, as part of an infusion.

8. Retention of Urea and Other Nonprotein Nitrogen Products in the [illegible]

[illegible]

travenously, since it also may act as a diuretic.

9. Ketosis. This may exist because of an inability to eat and, therefore, an excessive burning of body fats. The treatment for this condition is to increase the carbohydrate intake, either by mouth or intravenously.

General Considerations

From the foregoing outline it is evident that the dietary treatment in preoperative conditions must be given careful consideration. If any one of the conditions mentioned above exists, it should be treated before the patient undergoes operation (except in emergencies); otherwise, complications may result.

Even in patients in good nutritional state, the preoperative diet is important to enable them to withstand the shock of operation and the deprivation of food for the first few days of the postoperative period with as little nutritive loss as possible.

Foods high in carbohydrate will aid in providing a good store of glycogen. [illegible]

or by intravenous infusion

Special preoperative procedures may be necessary for certain conditions For instance, if there is to be an operation on the large intestine or the rectum, a low residue diet will be necessary for several days preceding the operation. Diabetics must be well controlled before elective surgery is undertaken. Patients with hyperthyroidism should be gaining weight before operation is performed

All food is withheld immediately before operation as undigested food in the gastro-intestinal tract may cause vomiting with the possibility of aspiration of food into the bronchi, or it may give rise to distention postoperatively. The length of time for the withholding of food depends upon the type of operation. In preparation for minor surgery no food is allowed on the day of the operation, unless the operation is delayed until the afternoon, in which case a light breakfast of cereal, toast, coffee and fruit juices may be given.

For abdominal operations, a clear or full fluid diet may be ordered for 2 or 3

days preceding the operation in order

POSTOPERATIVE DIETS

Specific Considerations

The state of nutrition of the patient following operation must be maintained, but, owing to the toxicity of the anesthetic, nausea is likely to occur The

supplies this. Of even greater impor-

are a routine procedure immediately after major operations. Protein hydrol-

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Maintenance of salt balance is equally necessary. Salts may be lost by the same routes by which fluid is lost. The use of physiologic saline is indicated

given in one solution

Food by Mouth. Except in operations on the gastro-intestinal tract, the first thing given by mouth is water in sips as soon as the nausea stops If preferred, bits of ice may be held in the mouth; this supplies small amounts of water. If the sips of water do not cause vomiting, other liquids, such as tea with sugar, ginger ale and broth, are added next.

From this stage the patient will progress to a full-liquid, a soft and, finally, a general house diet (*See* Chap. 18) With the early ambulation for surgical patients in vogue at the present time, there is a much more rapid recovery from the postoperative state and, therefore, a rapid increase in the diet It is not uncommon for a patient to be on a general diet by the second postoperative day. The great advantage of this rapid progression in dietary intake is that there is little loss in the nutritional state of the patient and, therefore, more rapid recovery.

Complications. In patients in whom recovery from surgery is slowed for some reason, the problem of maintaining nutrition may become acute Holden[1] has shown that both weight and tissue nitrogen losses occur very rapidly when postsurgical patients do not have a sufficient caloric intake. Intravenous glucose and amino acids cannot be given in sufficient quantities to meet caloric and protein needs; consequently, body protein and fat are broken down. For some years research has been carried on to perfect a fat emulsion which can be given by vein,

weight and tissue loss. Until such time, every effort must be made to increase the food intake by mouth. When it is not possible for the patient to eat all the food served to him, tube feedings may have to be resorted to (See end of this chapter.)

[1] Holden, W. D, *et al.*: Ann. Surg. 146: 563, 1957.

Special Routines for Operations on the Gastro-Intestinal Tract

[illegible]

within the tract itself. The principles of the diet, therefore, are that it be non- [illegible]

mate aim in the treatment of patients who are recuperating from gastro-intestinal surgery; but the patient should be warned that the return may be slow and that it is imperative that he follow the regimen carefully.

Most surgeons have their own preferred schedules which they wish to have followed, but most of them incorporate the principles stated above. By way of illustration, however, a typical regimen is given.

Diet in Surgery of the Stomach or the Duodenum. This operation may consist of resection of a large part of the stomach and a section of the duodenum, either for cancer or for peptic ulcer. The *usual procedure is to give nothing by* mouth for from 24 to 48 hours after the

SUGGESTED DIETARY REGIMEN FOLLOWING OPERATIONS ON THE STOMACH OR THE DUODENUM

DAY AFTER OPERATION	FOOD ALLOWED
1 and 2	Nothing by mouth
3	30 cc water every hour while awake
4	60 cc. water alternating with 60 cc. milk every hour while awake
5	90 cc milk every hour while awake plus Cream of Wheat at breakfast Soft-cooked or poached egg at supper
6	120 cc milk every hour while awake plus Cream of Wheat at breakfast Cream soup made of puréed bland vegetables such as peas, carrots, [illegible]

SAMPLE DIET. DAY 10

Breakfast	*Lunch*	*Supper*
Diluted orange juice Soft-cooked egg White-bread toast Butter Postum, cream	Cream of spinach soup Minced chicken White-bread toast Butter Milk, ½ glass	Poached egg on toast Milk, ½ glass *Canned peaches*
10 A M	3 P M.	10 P M.
Cream of Wheat Sugar Milk, 1 glass	Baked custard Milk, 1 glass	Milk, 1 glass Lemon gelatin Sponge cake

operation and to provide for the body's nutritional needs by intravenous fluids. After this, water in small amounts is [illegible] stimulating or mechanically irritating foods.

This routine, while it is necessary because of the site of the operation, calls for a period of 1 or 2 weeks when food intake is most inadequate. Intravenous feeding will aid in meeting nutritional needs to some extent, but it is important that the patient's food intake be increased as rapidly as possible, so that health and strength may be regained.

If a large part or all of the stomach has been resected, pernicious anemia may make its appearance 2 or 3 years following the surgery, when liver stores of vitamin B_{12} are exhausted. The intrinsic factor produced by the normal stomach and essential for the absorption of vitamin B_{12} may be entirely absent. Fortunately, adequate therapy with vitamin B_{12} is a simple matter if the physician is aware of this possible complication.[2]

The Dumping Syndrome. Most patients undergoing gastric surgery develop a new pouch by stretching the remaining stomach tissue. This now acts [illegible] "dumping syndrome"

In this syndrome, the ingested food is not held in the remaining stomach pouch but is "dumped" in its entirety into the jejunum 15 to 30 minutes after eating. Because it is concentrated in comparison with the body fluids, water is withdrawn from the circulatory system into the intestines. This may lower the total blood volume sufficiently to cause lowered blood pressure and symptoms of cardiac insufficiency, characterized by sweating, faintness and nausea. About 2 hours after a meal, a further effect may appear Because the quantity of food which has been "dumped" into the jejunum is large, absorption, especially of carbohydrate, is very rapid This leads to an overproduction of insulin and to an eventual drop of the blood sugar level below normal fasting levels. The symptoms of mild insulin [illegible] comfort is associated with the ingestion of food. Moreover, the unusual activity of the digestive tract may cause diarrhea and loss of food, further increasing the tendency toward malnutrition and weight loss.

Dietary Treatment

The control of these manifestations by dietary measures is not an easy matter. Hayes[3] found that it was necessary to hospitalize the patient in order to find the exact dietary regimen suited to his needs. Beginning with small amounts, [illegible] low in carbohydrate to prevent the hypoglycemia (low blood sugar) referred to in a previous paragraph.

Such a diet would be given in at least 6 or possibly 8 small meals. Eggs, meat, liver, fish, poultry and cheese are well tolerated, but whole milk sometimes causes difficulty Dry skim milk may be more acceptable. Liprotein,[4] a commercial food concentrate high in protein and fat and low in carbohydrate, may be substituted for whole milk if the phy-

[2] Halsted, J. A., et al.: New England J Med. 251.161, 1954.

[3] Hayes, M A.: J. Am. Dietet. A. 31: 133, 1955

[4] The Upjohn Company, Kalamazoo, Mich.

HIGH PROTEIN, HIGH FAT, LOW CARBOHYDRATE "ANTIDUMPING" DIET*

General Directions.

1. This diet should be divided into 6 to 8 meals a day.
2. Omit fluids with meals, especially at breakfast. They may be taken half an hour following meals.
3. No food, especially fluids, should be eaten chilled or very cold.

Foods To Be Included and To Be Avoided:

Milk	1½ pints whole milk or yoghurt. Should not be taken too cold.
Cream	¼ pint heavy cream or ½ pint light or sour cream
Cheese	1 oz. or more. All cheeses are allowed, but cream cheese is preferred.
Fats	5 tablespoons butter, margarine, oils, fats, mayonnaise, French dressing
Eggs	3 eggs, in any form desired. (Eggnogs for between-meal feedings may be made from milk, cream, eggs and vanilla.)
Meat, fish, fowl	8 ozs. or 2 large servings. (Do not include bread crumbs or stuffing, or thickened gravies.)
Soups	None with meals. Broth, bouillon or unthickened soups may be taken between meals.
Vegetables	2 servings, including 1 green or deep yellow. If tolerated, 1 vegetable may be served raw as a salad, with mayonnaise added. Omit sweet potatoes, corn and Lima beans. White potatoes are allowed only as a substitute for bread
Fruits	2 servings, including 4 ozs citrus juice or fruit. Use *fresh, cooked or canned unsweetened fruits or fruit juices* Prune juice and banana only if substituted for bread
Bread, cereals, Italian pastes	4 slices of bread or equivalent.

Bread Equivalents

Crackers, graham	2 medium
[illegible]	[illegible]
Cereal, cooked	2 rounded tablespoons
Rice, macaroni, noodles, spaghetti	½ c. cooked
Banana	½ medium
Prune juice	4-oz. glass
Potato, white	½ medium

Desserts .... [illegible]

* Adapted from the Antic[illegible] York Hospital.

Beverages	Milk,† unsweetened eggnog, tea and coffee
Miscellaneous	Unsalted nuts, if tolerated. Moderate amounts of salt, spices, ketchup, Saccharin and Sucaryl for sweetening

Foods To Be Omitted:

Sugar, jellies, jams, honey, syrups, molasses, candies, alcoholic and carbonated beverages, cakes, cookies, hot breads, pastries, puddings, frozen fruits, figs, dates, thickened gravies and cream sauces, cornstarch, tapioca, potato flour and barley

[illegible]

[illegible]

tables, except gaseous ones, fresh and unsweetened canned fruit, a limited amount of potato, bread and crackers, and occasional cereal make up the carbohydrate allowance Sugar should not be used in any form. Sucaryl and saccharin may be used for sweetening. Some patients do better when fluids are taken at other than mealtimes, especially at breakfast (*See* Foods To Be Included and To Be Avoided on pages 378 and 379.)

A less severe sign of nutritional difficulty following gastrectomy may be fail-

[illegible]

in an effort to help him gain weight and strength.

The dietary adjustment to this syndrome is a slow process and is best

[illegible]

customary to continue the low fat diet for from 3 to 6 months following operation Cholecystokinin, the hormone produced in the duodenum by the presence of fat, not only stimulates the contraction of the gallbladder but also of the smooth muscle in the common duct and the ampulla of Vater, the opening of the common duct into the intestinal tract. Even with the gallbladder removed, there is possibility of pain from contraction of these other areas upon the ingestion of considerable amounts of fat This is the indication, therefore, for a low fat diet The restrictions for this diet will be found in Chapter 25

Diet in Ileostomy or Colostomy. This diet is described in detail in Chapter 24

Following operation for hemorrhoids or other rectal surgery, an opiate usually is given to prevent defecation A residue-free diet is also given for 2 or 3 days to avoid a bowel movement.

[illegible]

Tonsillectomy Diet

After a tonsillectomy or other minor mouth or throat operation, cold fluids only are allowed for the first 24 hours to prevent bleeding from the operative area. Sharp fruit juices must not be given, as they will cause pain Toast or other food which may irritate the operative site must be avoided, as it may cause coughing. Water, milk, vanilla ice

cream and bland fruit juices such as pear or white cherry juice are permitted. The adult patient may find iced tea or iced coffee refreshing. On the second day, warm but not hot liquids are added. Soft bland foods such as milk toast, custard, soft-cooked egg, soft-cooked cereals and vegetable purées may be permitted on the third and the fourth days. The patient usually discovers what foods will slip down easily; it may be from several days to a week before a regular diet can be resumed.

Radical Surgery of the Mouth and the Throat

Following radical surgery of the mouth or the throat, the patient may have to follow a liquid diet for a long [illegible] to be as nearly normal as possible. Variety in the liquid diet can best be obtained by means of a food blender or liquidizer. With such an appliance meat as well as other foods can be liquefied, so that a diet approaching the usual pattern can be served. Instead of a succession of soups, eggnogs and other liquids, dinner may consist of meat, potatoes, vegetables, fruit and pudding, all liquefied. Soft and liquid diets may also be prepared by putting the food through a food mill or sieve and adding liquids. If these devices are not available, commercially prepared baby foods can be used since they contain only a small amount of seasoning [5]

The tray should be served in the usual fashion, so that the patient will have the pleasure of sight and odor of food to stimulate his appetite.

Tube Feedings

There are many occasions when, because of operation, accident or unconsciousness, the patient must be fed by tube. If this type of feeding is to be *continued for some time, it is* important that the diet be adequate for all nutritional needs and yet liquid in consistency.

If the patient is conscious, and as soon as his condition will allow, a variety of liquid food prepared by blender, as described under Radical Surgery of the Mouth and the Throat, is to be preferred in place of a prepared tube feeding.

In the unconscious patient, it is particularly important for the nurse to realize that good nutrition is essential in the prevention of pressure sores and decubitus ulcers. Immobilization causes an increased breakdown of protein tissue, which must be replaced by a more than adequate amount of protein in the diet. (*See* Chap. 17.) Unconscious patients sometimes resist being fed, but that should not deter the nurse from seeing that an adequate intake of food is achieved each day.

Tube Feeding 1, on page 381, supplies approximately 170 Gm. protein and 2,400 calories. It is high in protein and is well above the Recommended Dietary Allowances (*see* Chap. 10) for calcium, iron and the vitamins, with the exception of thiamine, which is adequate. If strained liver (for infants) is used in place of fresh liver, the feeding will be low in ascorbic acid, in which case the vitamin should be supplied by medication.

This feeding may be made low in sodium by substituting Lonalac[6] or other *low sodium milk for the regular milk.* It may be made low in fat by using skim milk in place of whole fluid milk. It has to be remembered that the latter will also lower the caloric value.

Tube Feeding 2, on page 382, uses a variety of common foods, mixed in a blender and strained. It is thought that a mixture of foods as they com-

[5] Cancer Nursing, A Manual for Public Health Nurses, National Cancer Institute and the New York State Department of Health, revised 1955

[6] Mead Johnson and Company, Evansville, Ind.

Tube Feeding 1*

Food	Measure	Weight Gm.	Calories	Protein Gm.	Fat Gm	Carbohydrate Gm	Minerals: Calcium Mg.	Minerals: Iron Mg.	Vitamins: A I U	Vitamins: Thiamine Mg	Vitamins: Riboflavin Mg.	Vitamins: Niacin Mg	Vitamins: Ascorbic Acid Mg
Milk	1½ quarts	1,500	1,020	52	60	75	1,770	1 5	2,400	60	2 55	1 5	15
Eggs	3	150	239	19	18	1	80	4 0	1,690	15	43	1	
Glucose	4 ozs	120	480			120							
Protinal†	½ c.	100	360	61		30							
Liver, lightly broiled‡	7 ozs	200	272	40	6	12	14	13 2	87,800	52	6 66	27 4	62
Totals			2,371	172	84	238	1,864	18 7	91,890	1 27	9 64	29 0	77

* From Sengstaken, R. W., and Blakemore, A. H: Ann Surg 131 781 1950

† A low sodium, high protein product derived from casein (National Drug Company)

‡ Composition figures are for uncooked beef liver Figures will differ slightly following cooking or if a different animal liver is used If strained liver (infant food) is used, the figures will differ considerably *See* Table 1, Part Four.

Directions: Broil liver lightly cut in small pieces and remove veins Add to rest of ingredients in mechanical blender and mix for 10 minutes Strain through fine sieve, place in bottles with covers, label and refrigerate. Shake before pouring Tube feeding should be warmed to body temperature over hot water before being served to the patient.

Note (1) This feeding contains approximately 1,250 mg sodium By using Lonalac (Mead Johnson) or other low sodium milk, the sodium content may be reduced to approximately 500 mg (2) To lower the fat content, use skim instead of whole milk

cream and bland fruit juices such as pear or white cherry juice are permitted. The adult patient *may find iced tea or iced* coffee refreshing. On the second day, warm but not hot liquids are added. Soft bland foods such as milk toast, custard, soft-cooked egg, soft-cooked cereals and vegetable purées may be permitted on the third and the fourth days. The patient usually discovers what foods will slip down easily, it may be from several days to a week before a regular diet can be resumed.

Radical Surgery of the Mouth and the Throat

Following radical surgery of the mouth or the throat, the patient may have to follow a liquid diet for a long [illegible] to be as nearly normal as possible. Variety in the liquid diet can best be obtained by means of a food blender or liquidizer. With such an appliance meat as well as other foods can be liquefied, so that a diet approaching the usual pattern can be served. Instead of a succession of soups, eggnogs and other liquids, dinner may consist of meat, potatoes, vegetables, fruit and pudding, all liquefied. Soft and liquid diets may also be prepared by putting the food through a food mill or sieve and adding liquids. If these devices are not available, commercially prepared baby foods can be used since they contain only a small amount of seasoning.[5]

The tray should be served in the usual fashion, so that the patient will have the pleasure of sight and odor of food to stimulate his appetite.

Tube Feedings

There are many occasions when, because of operation, accident or unconsciousness, the patient must be fed by tube. If this type of feeding is to be *continued for some time, it is im*portant that the diet be adequate for all nutritional needs and yet liquid in consistency.

If the patient is conscious, and as soon as his condition will allow, a variety of liquid food prepared by blender, as described under Radical Surgery of the Mouth and the Throat, is to be preferred in place of a prepared tube feeding.

In the unconscious patient, it is particularly important for the nurse to realize that good nutrition is essential in the prevention of pressure sores and decubitus ulcers Immobilization causes an increased breakdown of protein tissue, which must be replaced by a more than adequate amount of protein in the diet. (*See* Chap. 17.) Unconscious patients sometimes resist being fed, but that should not deter the nurse from seeing that an adequate intake of food is achieved each day.

Tube Feeding 1, on page 381, supplies approximately 170 Gm. protein and 2,400 calories. It is high in protein and is well above the Recommended Dietary Allowances (*see* Chap. 10) for calcium, iron and the vitamins, with the exception of thiamine, which is adequate If strained liver (for infants) is used in place of fresh liver, the feeding will be low in ascorbic acid, in which case the vitamin should be supplied by medication.

This feeding may be made low in sodium by substituting Lonalac[6] or other *low sodium milk for the regular milk.* It may be made low in fat by using skim milk in place of whole fluid milk. It has to be remembered that the latter will also lower the caloric value.

Tube Feeding 2, on page 382, uses a variety of common foods, mixed in a blender and strained. It is thought that a mixture of foods as they com-

[5] Cancer Nursing, A Manual for Public Health Nurses, National Cancer Institute and the New York State Department of Health, revised 1955.

[6] Mead Johnson and Company, Evansville, Ind.

monly appear in the diet may prevent the occurrence of diarrhea, which so often complicates the care of the tube-fed patient. The apple juice is included for this reason, even though it contributes less of the essential nutrients than most fruit juices

This feeding contains 125 Gm protein and approximately 1,800 calories It is well above the Recommended Dietary Allowances, except for thiamine, which should be added by medication Calories may be added by increasing the cream and the farina, or by the addition of glucose or salad oil The latter should be added in small quantities only, as it may cause diarrhea. Calories may be decreased by omitting cream, by using skim instead of whole milk, or both

A variety of beverages suitable for tube feedings will be found in Chapter 50 If one of these is to be used for a

milk may be substituted in any of these

milk

A variety of commercially prepared tube feedings are available Most of these more than meet the Recommended Dietary Allowances when used in sufficient quantity. They tend to be somewhat more expensive than the tube feedings given here

All tube feedings should be given slowly to prevent diarrhea If diarrhea is constant, the addition of 2 tablespoonfuls of strained apple sauce or ½ oz of fluid pectin (such as Certo) to 1 quart of feeding may be beneficial. Tube feedings may also be given by a drip method to prevent diarrhea.



Fig 82 If the patient must be fed by tube, the feeding should be served in an attractive and appetizing manner, so that it reflects that this is food and not a medication. (Paul Parker)

Nursing Problem. Most patients find it difficult to accept tube feeding Again the nurse plays a decisive role in the adjustment that the patient makes to this procedure In an excellent article on the subject of tube feeding, Smith[7] says "The nursing care of the patient with a nasogastric tube in place may be relatively easy and pleasant for both the nurse and the patient, or it may be difficult, untidy and distressing Whichever it is depends in large measure on the nurse's attitudes and her appreciation of the patient's feelings "

BURNS

Severe burns are a surgical problem

fluids, salts and serum proteins through exudation There is also exces-

[7] Smith, A V.: Am. J Nursing 57.1451, 1957

TUBE FEEDING 2*

Food	Measure	Weight Gm	Calories	Protein Gm.	Fat Gm.	Carbohydrate Gm	Minerals: Calcium Mg.	Minerals: Iron Mg.	Vitamins: A I.U.	Vitamins: Thiamine Mg	Vitamins: Riboflavin Mg	Vitamins: Niacin Mg	Vitamins: Ascorbic Acid Mg.
Milk	1½ pints	750	510	26	30	38	885	8	1,200	.30	1.28	.8	8
Eggs	2	100	162	13	12	1	54	2.7	1,140	.10	.29	.1	
Cream, light, 18%	½ c.	100	204	3	20	4	97	.1	830	.03	.14	.1	1
Farina, enriched, cooked	1 c.	200	88	2	.	18	6	.4		.08	.06	.4	.
Bread, white, enriched	3 slices, no crusts	50	138	5	2	26	40	.9	.	.12	.07	1.1	.
Meat,† strained infant food													
Beef	3½ ozs.	100	100	17	3		10	4.0			.20	3.0	..
Liver	3½ ozs.	100	108	16	4	1	24	7.1	19,200	.04	2.14	6.4	.
Vegetables,† strained infant food													
Carrots	3½ ozs.	100	23	1	..	7	23	.7	8,430	.03	.03	.3	3
Peas	3½ ozs.	100	46	3	.	7	17	1.3	600	.10	.07	1.0	7
Protinal‡	½ c.	60	216	37	..	18							
Apple juice	1½ c.	300	150		.	42	18	1.5	120	.06	.09	..	3
Orange juice, fresh	½ c.	100	44	1		11	19	2	190	.08	.03	.2	49
Water added to 2 500 cc													
Totals			1,789	124	71	173	1,193	19.7	31,710	.94	4.40	13.4	71

* From the Department of Nutrition, The New York Hospital

† It is suggested that meats and vegetables be changed daily. This will alter the food composition somewhat. See Table 1, Part Four

‡ A low sodium, high protein product derived from casein (National Drug Company)

Directions: Place all ingredients in mechanical blender and mix for 10 minutes. Strain through fine sieve, place in bottles with covers, label and refrigerate. Shake before pouring. Tube feeding should be warmed to body temperature over hot water before being served to the patient.

NOTE: Calories may be added by increasing the cream and the farina, or by the addition of glucose or a small quantity of salad oil. Calories may be decreased by omitting cream, by using skim instead of whole milk, or both.

CHAPTER THIRTY-THREE

Nutrition in Diseases of Infancy and Childhood

PROBLEMS OF NUTRITION IN SICK CHILDREN

When children become ill they tend to regress to an earlier developmental level. This is often the case with eating habits. A baby who has been drinking from a cup will refuse fluids given this way but may accept them eagerly from a bottle. Self-feeding gives way to wanting to be fed. Also, the type of food the sick child will accept often is limited. The wisest response is to let him have his way. When he feels better, he will return quickly to his more recently acquired food practices and will [illegible]

Nutrition may become a serious problem in the child who is chronically ill or is suffering from an illness of considerable duration. Not only must enough food be eaten to meet the immediate nutritional needs, but growth and development must also be provided for. If the sick child has a poor appetite, it may be easier for him to eat smaller meals more frequently. Occasional surprises will help him to look forward to mealtimes. A "picnic" lunch or a tea party with mother or friends may stimulate the sick child to eat more than he would otherwise. There may be need of greater variation in the preparation of food. [illegible]

with brown sugar and dates or prunes is high in nutritive value and a pleasant [illegible]

cumstances (*see* Chap. 17). It is essential that their protein and milk intake be kept high by generous servings of meat, fish, poultry, eggs, milk and cheese. If the immobilization is likely to be of long duration, such as follows paralytic poliomyelitis, the problem is

sive tissue breakdown, lasting for a period of weeks, as evidenced by tre-

average negative nitrogen balance of 10.4 Gm daily, equivalent to a protein deficiency of 65 Gm.

In the first few days of treatment, plasma and whole blood, electrolyte solutions and protein hydrolysates are given by vein to combat the immediate losses of these substances As soon as possible a high protein, high caloric diet, supplemented with high protein, high caloric beverages, is prescribed. From 125 to 150 Gm protein and from 3,000 to 5,000 calories will meet the needs of the severely burned patient, but it may not be possible for him to ingest such a large quantity of food, and tube feedings may be necessary for a time (*See* Chap 25 for high protein, high caloric diets.) Calories may be further increased by adding butter, cream and sugar.

Patients who are burned about the mouth and the face may need to be tube-fed This should not be done, however, until the end of the first week of treatment. Badly burned patients usually have a gastro-intestinal atony the first few days after injury and do not tolerate tube feedings. (*See* the earlier

portive care of the severely burned patient by nurses, doctors, dietitians and

[8] Artz, C P., and Soroff, H S · J.A.M.A 159.411, 1955.

STUDY QUESTIONS

1. What are some of the nutritional deficiencies that may be met preoperatively in the surgical patient? How may these be corrected?
2. Why is the treatment of hypoproteinemia of importance both before and after operation?
3. Why is food withheld from the patient immediately prior to operation?
4. Which nutrient solutions may be administered by vein before the patient is able to take food by mouth?
5. List the foods permitted on a clear fluid diet. Which foods are omitted on a soft diet?
6. Which nutritional problems are likely to occur in the patient with a slow postoperative recovery? What are the dangers?
7. List the postoperative dietary regimen usually prescribed for a patient

syndrome"? What type of diet has been devised to meet this condition? Which foods must be omitted? Which limited?

9 Plan a tonsillectomy diet for an adult for the first postoperative day.

10. Plan a menu for a patient with a radical mouth operation who is on a fluid diet, making it as nearly normal as possible.

11. How may the sodium in Tube Feeding 1 be decreased? How may the fat be decreased? How may the calories in Tube Feeding 2 be increased? Decreased?

12. Give directions for preparing a tube feeding.

13. How may diarrhea be controlled in a patient who is being tube-fed?

14. What is the major nutritional problem in burns?

15 Find 5 different high protein, high caloric beverages in Chapter 50 that may appeal to a patient with burns.

See Bibliography in Part Four for other pertinent material on the topics discussed in this chapter.

complied with Especially, during an illness is not the time for a child to have to learn to eat new foods or to acquire new skills in eating unless he does this on his own initiative.

Children are subject to many diseases that are common to adults, as well as to some serious diseases which are associated primarily with childhood Infants may develop feeding difficulties such as vomiting, colic, diarrhea and constipation. Both infants and children suffer from a variety of infections Nutritional deficiencies in infants and young children still occur despite our knowledge. [illegible] of the nurse. Malnutrition, accompanied by underweight or obesity, occurs much too frequently when we consider the knowledge and the resources available to us.

FEEDING DIFFICULTIES IN INFANTS

Vomiting and Regurgitation

Vomiting may result from a number of causes and may or may not be a serious symptom In regurgitation only small amounts of food are lost, while in vomit- [illegible]

ous ailments and should be referred promptly to the physician The occasional vomiting, however, is usually caused by overdistention of the stomach due to the ingestion of too large or too frequent feedings or to the swallowing of air. It may also be due to an imbalance of the food constituents, especially to an oversupply of fat, causing delayed emptying of the stomach The cause should be determined and the feedings adjusted accordingly.

Regurgitation may be avoided by "burping" the infant once or twice during a feeding This is done by holding the baby so that his stomach is against the mother's shoulder and gently patting him on the back until the air bubble comes up

Colic

A baby who has hard crying spells [illegible]

again. Making sure he is warm may help Mothers are apt to think that his feeding is wrong, but changing the feeding usually does not help Spock[2] says that these babies seem to grow and gain weight better than most, and that generally the condition disappears at the age of 3 to 4 months

Diarrhea and Dysentery

Diarrhea is a common ailment of in- [illegible]

ficially fed babies than in breast-fed babies

Causes of Diarrhea Because a baby digests much larger quantities of food for his weight as compared with an adult, his digestive system is much more easily upset Diarrhea in infants may be caused by infection, in the bowel itself or anywhere in the body He may obtain the infection from someone in the family who is ill, or he may get it from his food Therefore, leftover formula [illegible]

alimentary tract is abnormally rapid in diarrhea, much of the food is either undigested or at least unabsorbed, therefore, the child loses weight rapidly and soon shows symptoms of malnutrition,

[2] Spock, B. Baby and Child Care, New York, Duell, 1957.



Fig 83. Lunches taste better when they are eaten in company with other children in the hospital. (General Hospital, Greenville, South Carolina)

even more serious, and every effort must be made to maintain good nutrition (*see* Chap 19)

If an infant or a child must be hospitalized, one of the immediate problems may pertain to food. The child is in strange surroundings, among strange people, moreover, he is ill All the concepts of child feeding discussed in Chapters 13 and 14 are applicable; besides this, the child must be given a great deal of freedom about his food, even to the point of allowing him to refuse it Some children will eat only bread and butter and drink milk for the first few days in the hospital, as these foods are most reminiscent of home This may often be the case with children from homes [illegible]

should be met by the nurse with warmth and understanding. If the child is not too ill, he will soon follow the lead of other children in his group and become more self-sufficient.

Some hospitals have daily visiting hours for parents in the late afternoon and the early evening, so that they may feed and play with their children. This has been extended still further by a few hospitals who permit the mother, or both parents, to stay with the child for as much time as they can spare, day or night, for the duration of the child's hospitalization.[1] Not only does this minimize the trauma of separation from the mother, but the child's nutrition is less likely to suffer.

Other ways of helping the child to feel at home in the hospital is to have him eat with other children of his age at a table as soon as this is feasible. Most of all, it is important that mealtime be a happy time, with no pressures about cleaning up plates, drinking all the milk or withholding dessert because some rule about eating habits has not been

[1] Hohle, B M: Am J. Nursing 57.865, 1957

grossly inadequate diets, with the milk intake too high and other foods too low in variety and quantity.

Treatment consists of iron medication, coupled with vitamins, since the intake of the latter is also unusually low in a restricted diet and because ascorbic and folic acids are necessary for blood formation. The diet should be changed as quickly as possible to the foods normally eaten by the patient's age group (see Chaps 13 and 14) The mother or the nurse may encounter considerable resistance at first, because the child will

Infantile Scurvy

Scurvy may appear in infants due to lack of knowledge on the part of the mother, to inaccessibility of fruit juices high in ascorbic acid or to changing food habits in the family Woodruff[6] reports an increasing incidence of scurvy in a Southern city, where parents had been taught not to give their babies "pot liquor" from vegetables cooked with salt pork or bacon but had failed to substitute the suggested fruit juices Nurses and other health workers need to be on guard constantly to be sure that nutrition instruction is understood and followed through. (For other and more severe manifestations of nutritional deficiencies, see Chap 20.)

INFECTIONS

Infections characterized by fever usu-

freely and to return to regular food intake as soon as possible If the child has a sore throat, do not aggravate it by giving such fluids as acid fruit juices or salty broth As the fever subsides, the appetite usually becomes progressively better, and the food intake increases accordingly If the illness has been prolonged with loss of weight, a diet increased in calories, protein and vitamins is indicated. Some of the suggestions made at the beginning of this chapter may be found helpful. (See also Chap 19.)

MALNUTRITION, UNDERWEIGHT, OBESITY

Malnutrition

Although, fortunately, obvious deficiency diseases are becoming rare, there are many children who do not grow and develop as they should because of poor food intake Some of the causes of malnutrition have been discussed in the foregoing pages and in Chapter 14 One must realize that there is danger of poor nutrition whenever a child is ill, and that an effort has to be made at all times to help him maintain as good nutritional status as is possible Children with rheumatic fever often become underweight Emotionally disturbed children may refuse to eat or may eat a one-sided diet In all cases of illness in children, attention to their nutritional needs should form part of the nursing care from the very first, and not after symptoms of malnutrition have begun to manifest themselves

Underweight

Children vary greatly in their rate of growth If a child gains weight and grows in height at a regular rate, even though he is somewhat thinner than other children of his height and age, there is no cause for alarm. The child who fails to grow and gain regularly should have not only his food habits but also his patterns of sleep, rest and exercise investigated and corrected where necessary. Between-meal feedings, especially at bedtime, added to a normal, adequate food intake, as well as suffi-

[6] Woodruff, C W.: J.A.M.A 161 448, 1956

which must be combated in the treatment. There is loss of water (dehydration), as well as loss of nutrients. The

no food is given until the diarrhea subsides.

is no return of diarrhea, a half and half mixture of boiled skim milk and water may be given, then increased to boiled skim milk alone, after which the baby is tried on a dilute formula. All feedings

formed. Acid milks are also available in powdered form and are much more easily prepared. The fine curd and the acidity of the milk are thought to make this type of formula easier to digest by

are more severe than diarrhea, including the presence of blood, pus and mucus in the stools. Unless properly diagnosed and treated, it may become recurrent or chronic.

Since the diarrhea or the dysentery is caused by an infection of the intestinal tract itself and may continue for an indefinite time, even when treated with antibiotics, the principal concern is to maintain the hydration and the nutrition of the infant. The progression of fluid and formula as described under diarrhea may also be used in dysentery. There may be more setbacks and slower progress due to the severity of the infection.

Constipation

mothers are concerned when the baby has only one bowel movement per day or on alternate days. The number of movements per day is not of so much importance as the consistency of the stools. If the feces are hard and expelled with difficulty, then the child may be said to be constipated and should be treated accordingly.[3]

The formula may be made more laxative by changing the type of sugar used. Prune juice or strained prunes, given once or twice a day, may remedy the situation. For the older child, an increase in the diet of whole-grain bread and cereals and of vegetables and fruits may be of help. If the constipation persists, the doctor should be consulted.

DEFICIENCY DISEASES OF INFANTS

Nutritional Anemia

Iron-deficiency anemia appears most often in premature babies or in babies whose mothers had an inadequate intake of iron in pregnancy.[4] Full-term infants, kept too long on a diet of milk, known to be low in iron, without the addition of other foods, may also develop iron-deficiency anemia. The ane-

[3] Infant Care, Children's Bureau, U. S Department of Health, Education and Welfare, Publ. No 8, 1955.

[4] Woodruff, C. W.: J.A.M.A. 162 659, 1956.

[5] Price, J. P., and Hart, W. M.: J.A.M.A. 148:5, 1952.

a week. The diet must include a least a quart of milk, 1 egg, 1 or 2 servings of [illegible]

[illegible] drate fruits (*see* Table 3, Part Four), 2 to 4 servings of bread and cereal; and 1 tablespoonful of butter or margarine Such a diet will contain from 1,500 to 1,600 calories The use of skim milk for whole milk will reduce the calories by approximately 300. Gelatin desserts made with Sucaryl and clear broth may be given as desired for "fill-up" foods (*See* Chap. 50 for low caloric recipes.)

Psychological Aspects. The work of Hilde Bruch[8] has indicated that much [illegible]

[illegible] problems involved Encouragement will help more than scolding, even when the diet has not been followed, and a personal interest in the child is of paramount importance.

The principles involved in the treatment are explained further in the chapter on underweight and overweight (*see* Chap. 21).

NUTRITION PROBLEMS OF CRIPPLED CHILDREN

Cleft Palate

Infants born with a cleft palate usually also have a cleft lip. The latter is repaired a few days after birth, but the repair of the palate must be postponed for from one to several years if the surgery is to be successful This leaves the infant for a length of time with a cleft in the roof of the mouth directly connected [illegible]

[illegible] gestions for the feeding of these chil-[illegible]

[illegible]

normal infants

Additional foods should be given as for the normally developing infant, although some adjustments may have to be made. If orange juice irritates the mucous membranes of the mouth and the nose, ascorbic acid will have to be substituted Strained vegetables may have to be thinned out with milk or broth and given by bottle, or the baby may take them better when thickened with the crumbs of a graham cracker. "Chewy" foods, such as bread crusts, should be introduced as early as possible to aid in developing proper jaw muscles and placement of teeth Pasty foods, such as peanut butter, cooked cheese dishes, leafy vegetables and creamed foods, all of which may form a part of the diet of the 3 year old, are poorly managed by the child with a cleft palate, as they stick to the roof of the mouth

Because it takes these children so much longer to eat than normal children, there is a constant danger of malnutrition The person feeding such a child needs patience and perseverance and, above all, freedom from anxiety so as not to communicate this to the child and impair the feeding process still further.

Directly following surgical closure of the cleft palate the most important aspect of feeding is to keep the repaired area clean and free of strain on the suture line. The diet is liquid and semiliquid for as long as 3 weeks (*see* Chap 18). Feedings must be given by

[8] Bruch, Hilde· J. Am. Dietet A. 20 361, 1944.

[9] Zickefoose, M : Children 4 225, 1957.

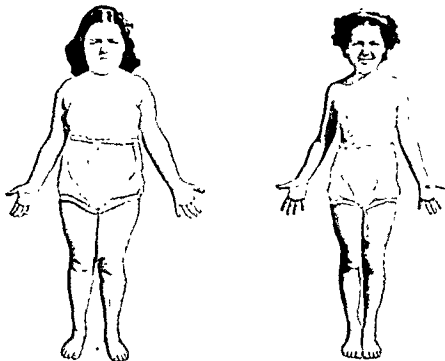


Fig. 84. Weight loss of 30 pounds over a period of 7 months in a 10-year-old girl. The personality improvement is at least as striking as the changes in anatomic contour. (Hoffman, R. H.: Obesity in childhood and adolescence, Am. J. Clin Nutr. 5:1, 1957)

cient sleep, are indicated as necessary for the underweight child.

Obesity

Overweight is due to an excess of food intake over and above the bodily requirement. This may be due in some cases to a lowered basal metabolism, but it is usually due to overeating and lack of exercise. Hoffman[7] stresses the need of weight loss early in life so that patterns of overeating may not be permanently established. He emphasizes that markedly overweight children are handicapped not only physically but emotionally. In a study of 60 obese children, he was able to obtain weight loss in all of them by diet and the judicious use of an anorexic drug. The parents, as well as the children, were involved in the effort to lose weight. At the end of 4 months, the children averaged a weight loss of approximately 20 lbs. and demonstrated notable improvement in posture and in mood.

The low caloric diet for a growing child should be calculated carefully so that no essential nutrients, with the exception of calories, are omitted. Weight loss should not exceed from 1 to 2 lbs.

[7] Hoffman, R. H.: Am J Clin. Nutr. 5:1, 1957.



Fig 86 Guiding the hand may be necessary at first when a child with cerebral palsy is learning to feed himself. Mealtime should be quiet and relaxed with all possibilities of excitement eliminated (National Society for Crippled Children and Adults)

help him to take fluids without spilling. Spoons with special handles, easy to grasp, will encourage self-feeding, [illegible]

[illegible]

as apple sauce and mashed potatoes, rather than peas or sliced, canned peaches

The aim for children with cerebral palsy is not only to achieve and maintain good nutrition but to help them to lead as normal a life as possible. Martin,[10] in an excellent article on feeding these children, gives the following 3 rules as a guide

1 Strive for an adequate diet based on the same nutritional standards established for normal children.

2 Prepare his meals as nearly like those of the family as practicable. . . . Make him feel that he belongs to the family, that he is like—not different from—the other members.

3 Make the rehabilitation period one of steady progression Consider each phase of his training in eating only a stepping stone to the next. Don't keep him on baby-type foods longer than necessary.

(For a discussion of the nutritional

[10] [illegible]



Fig 85. This little girl with cerebral palsy takes her fluids via a nipple attached to a tube. (National Society for Crippled Children and Adults)

cup or the side of a spoon, never by nipple or straw.

When healing has taken place, the child is returned to his regular diet. Those who have carious teeth or poor occlusion may continue to have difficulties in eating until good dental care has overcome this defect also.

Cerebral Palsy

Children with cerebral palsy present very special nutrition problems. Their constant movement, particularly in the athetoid type of palsy, increases the need for calories, yet the lack of neuromuscular control may make it difficult for them to drink from a cup or otherwise feed themselves. The over-all nutrition is often poor, due to difficulties in eating. They tend to be underweight and seem to be very susceptible to dental caries. It is essential that the diet of these children meet all their nutritional requirements and that it be served in as concentrated a form as possible

Milk puddings, custards, cereals cooked in milk, eggnogs, added butter or margarine on potatoes and bread, and creamed foods add calories and other nutrients without increasing bulk. The addition of dry skim milk to cooked cereals, meat loaf and puddings will increase the child's protein and calcium intake. The substitution of undiluted evaporated milk for the same quantity of whole milk in cooking reduces the amount of liquid that needs to be taken and increases the food value

Foods that can be eaten in the hand, such as sandwiches, hard-cooked egg cut in quarters, whole vegetables and orange sections (rather than orange juice), will encourage the child to feed himself. Drinking from a tube, as in Figure 85, or the use of a cup fitted with a device to reduce the rate of flow of liquid to the child's mouth will



Fig 86. Guiding the hand may be necessary at first when a child with cerebral palsy is learning to feed himself Mealtime should be quiet and relaxed with all possibilities of excitement eliminated. (National Society for Crippled Children and Adults)

help him to take fluids without spilling Spoons with special handles, easy to grasp, will encourage self-feeding, though it may be necessary to guide the child's hand until he becomes skilled enough to eat by himself. Foods should be those easily eaten with a spoon, such as apple sauce and mashed potatoes, rather than peas or sliced, canned peaches.

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3 Make the rehabilitation period one of steady progression Consider each phase of his training in eating only a stepping stone to the next Don't keep him on baby-type foods longer than necessary

(For a discussion of the nutritional

[10] Martin, E A. Crippled Child, Oct-Dec, 1956 Obtainable from National Society for Crippled Children and Adults, Inc, 111 South LaSalle Street, Chicago 3

problems of the poliomyelitis patient crippled by paralysis *see* Chap. 19.)

DISEASES SPECIFIC TO CHILDREN

Nephrosis

Nephrosis occurs most commonly in children from 2 to 5 or 6 years old. It *differs from nephritis in that, although* it is characterized by massive albuminuria and edema, there is no loss of red and white blood cells in the urine and no urea nitrogen retention in the blood, at least in the early stages. The most distressing symptom is the edema. Fortunately, the use of the pituitary hormone ACTH or cortisone often effects a diuresis and subsequent lessening of the edema. It is not known at present whether or not these hormones also affect the recovery of kidney function.

Dietary Treatment

Because children with nephrosis are usually severely and chronically ill, most physicians prefer that every effort be made to maintain the child in good nutrition rather than to prescribe restrictions in the diet. The picture of a child with kwashiorkor, a severe protein de- [illegible]

[illegible] ticularly the severe underlying malnutrition which becomes obvious when the edema has disappeared.

The child should be offered all the foods common to his age group. It may be necessary to concentrate the diet in order to get maximum nutrition in the [illegible]

[illegible] dings, ice cream and cream soups, as [illegible]

[illegible]

regain the nutritional status lost during the exacerbation of the disease.

Celiac Disease

Celiac disease occurs chiefly in young [illegible]

[illegible] The disease is characterized by the following symptoms:

1. A prominent, protruding abdomen.
2. Voluminous, frequent, pale stools, semifluid, containing abnormally large amounts of unabsorbed fatty acids. (The stool may also contain undigested starch grains.)
3. Marked retardation of growth.
4. *In cases of long standing,* edema of the face and the extremities, a sore and red tongue, excessive irritability and other signs and symptoms indicating extreme malnutrition.

It is known that the pancreatic enzymes are present in normal amounts in the duodenum; hence, the conclusion is that the cause of these symptoms is lack of absorption rather than failure of digestion.

Dietary Treatment

Restricted Starch, High Protein, Low Fat Diet. Andersen[11] represents the school of thought which eliminates all starch and most of the fat from the diet in the first stage of treatment. She allows a plentiful supply of protein, which *is well digested and absorbed,* and a restricted variety of vegetables and fruits. Of the latter, bananas are especially well tolerated and, if eaten in sufficient amounts, will provide the bulk of the calories needed by the celiac patient

The initial diet would permit choice of the following foods, depending on the age of the child and the severity of the disease.

Protein or boiled skim or whole milk
Sieved or minced liver and beef

[11] Andersen, D. H, and Mike, E M: J. Am Dietet. A. 31:340, 1955.

Uncreamed cottage (pot) cheese
Hard-cooked or coddled eggs
Orange, grapefruit or tomato juice
Ripe bananas, banana purée, banana powder, apple sauce, scraped raw apple
Strained green beans, carrots or squash.

As has already been indicated, the small child with celiac disease may present a picture of moderate to severe malnutrition. Since the above foods are well tolerated, the total food intake may be quite large and, despite the limitations of the diet, may more than meet the nutritional requirements. However, most physicians prescribe added vitamins and mineral supplements

The patient is usually kept on the above regimen for a period of months or even longer. With clinical improvement, fats in the form of butter and peanut butter, and starches such as zwieback, Melba toast, crisp toast, and 2 or 3 arrowroot crackers or Social Tea biscuits are gradually permitted. Further additions are strained or chopped asparagus, beets, peas, spinach and tomatoes, ripe pear, cooked or canned apricots, pears and peaches, and a greater choice of fruit juices Lamb, chicken and fish are now also included in the diet

The diet is gradually liberalized to include such starches as potato, rice, cereals (omitting wheat and rye initially), angel food and sponge cake, and popcorn. Last to be added and used in moderation are untoasted bread, macaroni, spaghetti and noodles.

"Gluten-Free" Diet. In 1951, three Dutch investigators[12] discovered that the excretion of fatty acids in celiac children was decreased markedly when wheat, rye and oats were omitted from the diet. They, Sheldon,[13] and other investigators have since found that all foods are well tolerated, including fats and starch, so long as all cereal grains except rice and corn, both free from gluten, are excluded from the diet When wheat gluten was added to such a diet, the excretion of fatty acids promptly recurred On the other hand, the addition of gluten-free wheat starch caused no increase in fatty acid excretion All children with celiac disease placed on a "gluten-free" diet, even those very seriously ill, made remarkable recoveries on such a regimen

The Dutch investigators[14] have since shown that it is the configuration within the cereal protein molecule of wheat, rye and oatmeal that presents the problem, and that gliadin, another wheat protein, is equally offensive (For further discussion *see* Sprue in Chap 24)

It would seem, then, that celiac disease may well be an acute sensitivity to the proteins found in wheat, rye and oat grain, and that all these proteins must be excluded from the diet of patients with this disease As no data are available for the action of buckwheat and barley, it would seem wise to exclude these also from the diet Corn and rice, which were well tolerated, protein-free wheat starch, and soy flour are all permissible and may be used as substitutes for the cereals which must be omitted

The exclusion of all cereal grains except corn, rice, protein-free wheat starch and soy flour is not an easy matter Ordinary wheat flour particularly appears in so many guises other than bread, such as bread stuffings, bread crumbs, thickenings for gravies and cream soups, spaghetti, macaroni, noodles and many other foods, that labels must be watched carefully to detect its presence. Recipes for bread, biscuits and cookies made from permitted flours are included in Chapter 50, Therapeutic Recipes The table list-

[12] Dicke, W K., Weijers, H. A., and van de Kamer, J. H: Acta paediat. 42 34, 97, 223, 1953

[13] Sheldon, W., and Lawson, D. Lancet 2 902, 1952.

[14] van de Kamer, J. H., and Weijers, H. A.: Acta paediat. 44 465, 1955

ing the Foods Allowed and Foods To Be Avoided on the "Gluten-Free" diet will be found under Sprue in Chapter 24.

Pancreatic Insufficiency

Cystic fibrosis of the pancreas is a congenital disease resulting in a marked decrease or the entire absence of pancreatic enzymes The stools contain undigested food, particularly fat, and the disease was originally confused with celiac disease. However, the absence of pancreatic enzymes shows that this disease is due to an inability to digest food rather than to an interference with its absorption, as in celiac disease.

Because so much undigested food is lost in the feces, the diet should be high in calories (30% to 50% above normal requirements). The protein in the diet should also be markedly increased to

[illegible]

supplemented with vitamins, particularly the fat-soluble ones. Usually pancreatin (commercially extracted pancreatic juice) is given with each feeding to aid digestion.

Children with cystic fibrosis of the pancreas may also have involvement of the mucus glands of the lungs. Recently it has been shown that these children lose larger than normal amounts of so-

[illegible]

to prevent heat prostration.

Phenylketonuria

Phenylketonuria is an inborn defect in the body's ability to metabolize the amino acid phenylalanine. The quantity

[illegible]

the first symptom noted. The infant is normal at birth, but phenylalanine may appear in the urine as early as from a week to a few months of age. In phenylketonuria, there seems to be a substance present which has a deleterious effect on

[illegible]

In the last decade an attempt has been made to treat phenylketonuria with a diet free of phenylalanine or very low in it. If the treatment is started very early, when symptoms are first exhibited and before brain damage has occurred, the results are encouraging. In older children with established mental deficiency, the diet has not been effective.[15]

Because phenylalanine is found in about the same proportion in all food proteins, a commercially prepared product, Ketonil,[16] free of phenylalanine has been made available. It contains all the *other amino acids and the* mineral salts necessary for the growing infant. Calories and fluid are made up by adding salad oil, sugar and water, and the whole is prepared as a formula feeding. All the vitamins must be given by supplementation, as none is present in Ketonil. For children beyond the formula stage of feeding, the mixture may be given as a thick soup or paste.

When phenylalanine has disappeared from the urine, in about 3 weeks, 5 Gm of natural protein is added to the diet. This quantity provides the phenylalanine necessary for tissue growth without causing a rise in blood levels or excretion into the urine. Commercially strained baby foods such as fruits, vegetables and cereal are best for this purpose, as the label on the can or the jar gives the quantity of protein it contains. By using foods low in protein, a greater variety of foods can be included. The mother

[15] Armstrong, M D, *et al* Am. J. Clin. Nutr. 5,543, 1957.

[16] Merck, Sharp and Dohme, Philadelphia The accompanying booklet gives full details for preparation of the formula and for the addition of other foods

should be careful, however, not to exceed the allowance of 5 Gm. of protein

It is suggested that the natural food be mixed with the Ketonil formula so that the child will not refuse the latter. Children on such a restricted diet must be watched very carefully to avoid severe nutritional failure due to inadequate protein or caloric intake.

The length of time the diet must be continued and the prognosis are uncertain In a few of the cases reported[17] there are indications that at the end of 18 months to 2 years of treatment a return to a normal diet does not interfere with the further development of the child

Galactosemia

Galactosemia is another inborn defect of metabolism in which, as its name indicates, the body is not able to utilize galactose Normally this sugar, derived from the lactose in milk, is converted to glucose in the liver. This does not occur in infants suffering from this disorder, the blood level of galactose rises, and the sugar is found in the urine Such infants develop early nutritional failure, enlargement of the liver and the spleen, jaundice, mental retardation and cataracts. On removing galactose from the diet there is striking improvement All symptoms regress and may even disappear entirely except for the mental retardation once this is established.[18]

Milk is the only food source of galactose, therefore, it must be eliminated Fortunately, there are several commercially available substitutes such as Nutramigen,[19] soybean milk and meat base formula[20] which are quite satisfactory for growth and do not contain lactose or galactose

[17] Armstrong *Op cit*

[18] Isselbacher, K. J Am. J. Clin Nutr. 5 527, 1957

[19] Mead Johnson, Evansville, Ind.

[20] Gerber Products Company, Fremont, Mich.

DISEASES COMMON TO CHILDREN AND ADULTS

Cardiac Disease

Congenital heart disease and cardiac damage due to rheumatic fever are discussed in Chapter 27.

Diabetes

The two schools of thought in regard to the dietary treatment of diabetes have been discussed in Chapter 22 Particularly in the treatment of children with diabetes, opinion is sharply divided about the effect of strict control of the diabetes on the rate of development of vascular complications Marble,[21] who belongs to the school that holds that such complications can be held off by strict control, outlines the plan for treatment as follows

1 The diet should be entirely adequate in terms of protein, minerals, vitamins and calories

2 Carbohydrate should be limited in general to 200 Gm , and certainly to 225 Gm a day

3 Between-meal snacks, adjusted in content to the type of insulin program being used, should be provided

4 Reasonable constancy of dietary pattern from day to day should be achieved

In order to carry out this dietary program, parents—and the patient if he is old enough—are taught to calculate and weigh the diet until they are reasonably accurate in evaluating quantities. After this the portions of food may be estimated, but a return to weighing is suggested for short periods of time to keep the diet accurate

Many physicians, believing in a reasonable degree of control in the child diabetic, find Meal Planning and Exchange Lists of greater usefulness than using a calculated and weighed diet (*see* Chap 22)

Lastly, those leaning toward the so-

[21] Marble, A.: J Am. Dietet. A. 33 569, 1957.

ing the Foods Allowed and Foods To Be Avoided on the "Gluten-Free" diet will be found under Sprue in Chapter 24.

Pancreatic Insufficiency

Cystic fibrosis of the pancreas is a congenital disease resulting in a marked decrease or the entire absence of pancreatic enzymes. The stools contain undigested food, particularly fat, and the disease was originally confused with celiac disease However, the absence of pancreatic enzymes shows that this disease is due to an inability to digest food rather than to an interference with its absorption, as in celiac disease.

Because so much undigested food is lost in the feces, the diet should be high in calories (30% to 50% above normal requirements). The protein in the diet should also be markedly increased to [illegible]

supplemented with vitamins, particularly the fat-soluble ones. Usually pancreatin (commercially extracted pancreatic juice) is given with each feeding to aid digestion

Children with cystic fibrosis of the pancreas may also have involvement of the mucus glands of the lungs. Recently it has been shown that these children lose larger than normal amounts of so- [illegible]

to prevent heat prostration.

Phenylketonuria

Phenylketonuria is an inborn defect in the body's ability to metabolize the [illegible]

the first symptom noted. The infant is normal at birth, but phenylalanine may appear in the urine as early as from a week to a few months of age. In phenylketonuria, there seems to be a substance present which has a deleterious effect on [illegible]

In the last decade an attempt has been made to treat phenylketonuria with a diet free of phenylalanine or very low in it. If the treatment is started very [illegible]

children with established mental deficiency, the diet has not been effective[15]

Because phenylalanine is found in about the same proportion in all food proteins, a commercially prepared product, Ketonil,[16] free of phenylalanine has been made available. It contains all the other amino acids and the mineral salts necessary for the growing infant. Calories and fluid are made up by adding salad oil, sugar and water, and the whole is prepared as a formula feeding. All the vitamins must be given by supplementation, as none is present in Ketonil For children beyond the formula stage of feeding, the mixture may be given as a thick soup or paste.

When phenylalanine has disappeared from the urine, in about 3 weeks, 5 Gm of natural protein is added to the diet [illegible]

into the urine. Commercially strained baby foods such as fruits, vegetables and cereal are best for this purpose, as the label on the can or the jar gives the quantity of protein it contains. By using foods low in protein, a greater variety of foods can be included. The mother

[15] Armstrong, M. D, *et al.*: *Am J. Clin. Nutr* 5 543, 1957

[16] Merck, Sharp and Dohme, Philadelphia The accompanying booklet gives full details for preparation of the formula and for the addition of other foods.

19. Why should calories and protein be increased in the diet of a child with

[illegible]

21. What is galactosemia? How may galactose be eliminated from the diet? Name 2 nutritionally adequate substitutes.

22. What are some of the dietary problems of the child with rheumatic

[illegible]

ment of the child with the diabetes

24. Name an "elimination diet" suitable for a small child suspected of hav-

[illegible]

used for the child with a milk allergy? Are these nutritionally equal to milk?

See Bibliography in Part Four for other pertinent material on the topics discussed in this chapter.

called "free" school believe that it is particularly difficult to keep children, and especially adolescents, on carefully controlled diets Many physicians feel that the emotional trauma of keeping children on such diets is more harmful [illegible]

tails see Chap. 22.)

Allergy

Acute food allergies, such as allergy to cow's milk, to orange juice and to egg, are not uncommon in children. They may appear very early in life and are most often exhibited as severe eczema [illegible]

a soybean preparation or a meat base formula[22] is an adequate substitute. An "elimination diet" suitable for older children consists of lamb, rice, carrots, pears and soybean "milk." Vitamins must be added as supplements. The problems of allergy are discussed in Chapter 26.

Epilepsy

Epilepsy rarely occurs during infancy, but it may appear from very early childhood on. The dietary treatment is discussed in Chapter 30.

Nephritis

The dietary treatment of this disease is discussed in Chapter 28.

STUDY QUESTIONS

1. What may the mother or the nurse expect of a child's food habits when he is ill?
2. Name some of the nutritional problems in chronic illness or in illness of more than short duration. How may we try to meet these?
3. *How can a child be helped to adjust to eating his food in the hospital?*
4. What would you tell the mother of a *"colicky" baby?*
5. What are the causes of diarrhea and dysentery? What dietary measures are *indicated for each?*
6. What additions can be made to the feedings of an infant having constipation?
7. What are some of the causes of nutritional anemia in young children? How may they be prevented?
8. What precautions must be taken when a food pattern is changed in a family?
9. How are acute fevers in childhood treated by diet?
10. What are some of the causes of malnutrition in children?
11. List some of the causes of underweight.
12. Why should obesity in the child be treated promptly? Which foods must be included in a low caloric diet to keep it adequate for the nutritional needs of the obese child?
13. What should be the relationship between the obese child and the person *treating him?*
14. How may the nutritional problems of the child with cleft palate be met? What are some of the difficulties?
15. What nutritional problems are common to the child with cerebral palsy? How may some of these be met?
16. Why do many physicians permit the child with nephrosis to eat what he wishes?
17. Make out a menu for a day for a 2-year-old child with celiac disease on a restricted starch, high protein, low fat diet, using the foods allowed early in the treatment of the disease.
18. Plan a day's diet for a 5-year-old child with celiac disease on a "gluten-free" diet.

22 Gerber: *Op. cit.*

PART THREE

Food Selection and Preparation

Part Three deals with Food Selection and Preparation Although the nurse today is not often required to prepare food for an individual patient, her role as a teacher and an interpreter of good health practices demands that she have a sound knowledge of food as it appears on the family table Whether she works at the bedside or in the community as a public health, school or industrial nurse—in fact, in all areas where she functions—she is expected to have reliable information on many matters pertaining to the maintenance of health and the treatment of disease Not the least of these pertains to food and its preparation.

The nurse should know something of the variety of available foods and of how these may contribute to a pleasing and palatable menu A knowledge of the effect of methods of preservation and of cooking processes on the retention or the destruction of food nutrients will help her to interpret these data to the public. An appreciation of which foods a given recipe is likely to contain will aid her in knowing whether or not such a food is permissible on a given therapeutic diet Lastly, if the nurse can make practical suggestions for making a therapeutic diet more palatable and, therefore, more acceptable, it is more likely to be followed The following section has been written to help her obtain some of this information and to give her some experience in the preparation of food that is "good to eat."

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CHAPTER THIRTY-FOUR

Introduction to Food Selection and Preparation

Food selection in a broad sense covers more than the choice of an adequate amount of variety foods. It includes planning for the day good meals which will be not only adequate nutritionally but satisfying to the appetite and to the taste. Foods which contrast in food value, color, flavor and texture, and blend, or, as it is often expressed, "go together," should be chosen to make up a meal.

ADEQUATE MENU FOR A DAY

An adequate and attractive menu for a day can be planned very easily on the basic dietary pattern which was discussed in Chapter 18. This can be varied from day to day, as well as from week to week, and there need be little repetition of the various items which make up a meal unless, as may be the case when it comes to breakfast, there is a preference for one type of menu. The basic dietary pattern, which includes 1 pint of milk, 1 serving of meat, 1 egg, 1 serving of some other protein food, 2 servings of fruit (one of the citrus variety, or tomatoes), 1 serving of a green or a yellow vegetable, 1 serving of another vegetable, 1 small potato, 3 slices of whole-grain or enriched bread, 1 serving of another cereal of the same type, 3 pats of butter or margarine, will provide an adequate, or almost adequate, amount of every dietary essential excepting calories. This allows for the use of sugar and shortening, which add so much to the texture and the flavor of so many cooked dishes, for the use of butter, cream or oil as dressing for vegetables and salads, and for the inclusion of extra fruit and other foods which have appetite appeal. The total amount in excess of the basic pattern should depend upon the calorie requirement rather than on the appetite alone.

It is not necessary to make any dietary calculation in planning meals for the normal person. It is good practice, however, to consider weight as one of the indications of normality. If weight is greater than average, menus should follow as closely as possible the basic pattern without calorie additions. If weight is under, it may be well to increase the amount of milk and eggs and to choose



Fig. 87. An attractively set tray tempts the appetite.

or provide foods which will especially tempt *the appetite. Food will often* alleviate fatigue and a condition which [illegible] both of [illegible] main meal of the day may be served at noon or in the evening, to suit convenience and preference. The basic pattern calls for meat, potatoes, some other vegetable and a dessert, with the addition of a salad if not used at another meal. The same general plan may be followed for the lighter meal, either luncheon at noon or supper *in the evening,* when a supplementary protein other than meat may be *the main dish.* This may be in the form of a soup made with a milk base, or an egg or a cheese dish *Such dishes will* sometimes be used as the main source of protein. Recipes will be found in Chapter 40 (Eggs), Chapter 42 (Cheese) and Chapter 38 (Cereals). Recipes for use of dried vegetables (legumes), which are also high in protein, will be found in Chapter 49 (Family-size Inexpensive Recipes). A dessert, which adds satisfaction to both luncheon and dinner, gives another opportunity for the use of milk and eggs.

The preparation of each meal depends first of all upon having all ingredients on hand. The order of *preparation of* each dish, so that all will be ready at the meal hour, *should be considered* first. If a baked product is in the meal plan, *the oven should* be preheated at the proper temperature, and time should be allowed *for* this as well as for baking The time indicated for the proper cook-

ing of meat, fish, eggs and vegetables should be estimated in order that they may be served as soon as they are cooked. Salad ingredients should be taken out of the refrigerator, where they have been placed in order to be crisp, and put together just before serving time. The table or the tray should be set so as to be ready when the food is at its best. Dishes for hot food should be warm, while those for cold food should be cold, or even chilled in the refrigerator.

FOOD FOR THE PATIENT

One of the responsibilities of the nurse is to make sure that the patient for whom she is caring is provided with appropriate, well-cooked and attractively served food. This is particularly important when the condition of the patient demands the restriction of certain foods. The food preferences of the patient must be considered, and, if foods to which there is a prejudice must be included, they should be made as attractive as possible in seasoning or flavor and appearance.

When food preferences are based upon national or regional food habits, the problem is even more difficult. For instance, in the case of a patient on a general diet who refuses milk as a beverage, effort should be made to use an extra amount in cooked dishes. These, however, will not always be acceptable to patients whose tastes have been con- [illegible] contributions of food but also cookery methods. Through this knowledge she will be better able to help the patient to adjust to a prescribed diet.

Often, the nurse will be responsible for tray arrangement. Clean, crisp linen and suitable dishes, heated or chilled according to the food to be served, and [illegible] color with the food often make a dish more tempting. Fresh sprigs of parsley, strips of pimiento or green pepper may often be used to good advantage with main dishes. A few berries, cherries, strips or segments of other fruits of bright color may add an interesting note to a plain dessert. A flower laid on the tray or placed in a low vase which cannot easily be upset may add a finishing touch. It is worth while to take pains with the preparation and the serving of food.

USE OF RECIPES

A recipe is a formula by which the [illegible] aration is begun. The recipes in the following chapters are for as small quantities as possible to ensure successful results.

The use of small utensils for the preparation of small recipes is an aid to success. A pint saucepan, a very small double boiler, a small strainer, a small drip coffee pot and a small teapot will make the preparation of small quantities easier and more successful than would be the case otherwise. It should be noted that the time allowance for small recipes is usually shorter than for the preparation of those of family size. Most small-quantity recipes prepared on top of the stove should be cooked over low heat. Temperature and time should be regulated carefully when individual baking dishes are used.

MEASURING INGREDIENTS

For the successful use of a recipe accurate measurements are important, particularly in the case of flour, sugar, shortening and leavening agents, such as bak-



Fig. 88. Only level measures are accurate measures. (Institute of Home Economics, U. S. Department of Agriculture)

ing powder and soda. Flour and confectioner's sugar must be sifted before being measured.

For the sake of texture and flavor, certain variations may be made according to taste after the basic preparation has been accomplished. At this time, for instance, more liquid may be added to a soup or a sauce recipe, and more seasoning may be added to taste to any dish. In fact, the cook should form the habit of tasting with a critical palate every dish which she prepares before serving.

[illegible] measuring the following [illegible]

or a set of measuring cups of the above volumes; tablespoons and teaspoons of regulation sizes or a set of measuring spoons.

To measure dry material by the cup, [illegible]

before measurement. Granulated sugar may be measured easily, but brown sugar should be packed firmly into the cup. Before measuring honey or syrup, rinse the cup with cold water.

Measurement of butter and margarine, when in ¼-lb. sticks, may be made by accurate division. One stick corresponds to the measurement of ½ cup. To measure bulk fat, pack firmly into cup to the desired mark of measurement. Except for pastry, fat should be at room temperature. (An easy way of measuring ½ cup of shortening is to fill the cup to half mark with cold water and add shortening enough to cause water to rise

to the 1-cup mark. To measure ¾ cup, fill with cold water to the three-quarter mark.)

To measure dry ingredients by the tablespoon or the teaspoon, fill until heaping and, with the cutting edge of a knife, brush off all that extends above the edge of the spoon. If one half spoonful is desired, divide the contents of the spoon lengthwise and push off one half [illegible] eighth is desired, divide the remaining one fourth crosswise and push off the portion not needed. If one third of a spoonful is desired, divide the contents of the spoon crosswise into thirds, pushing off the undesired portion.

To measure spoonfuls of liquid dip the spoon into the liquid.

TABLE OF MEASURES AND APPROXIMATE WEIGHTS

3 teaspoons	1 tbsp
16 tablespoons	1 cup
½ cup	1 gill
2 cups	1 pt.
4 cups	1 qt.
2 pints	1 qt.
4 quarts	1 gal.
1 tablespoon butter	½ oz.
*1 tablespoon liquid	½ oz.
1 tablespoon flour	¼ oz.
1 tablespoon sugar	½ oz.
*1 cup liquid	8 ozs
1 cup flour	4½ ozs
1 cup butter	8 ozs.
1 cup sugar	7 ozs.

* Water or milk

To measure butter or other solid fats, pack solidly into the spoon and level with a knife

The Metric System and Its Equivalents*

The metric system of weights and measures is commonly used in all types of scientific work. Dietary prescriptions are usually written in this system. The unit of volume is the liter (approximately 1 quart) of water which weighs 1,000 Gm. or 1 Kg

Below is given a table of metric weights and measures and their equivalents. When preparing weighed diets, extreme accuracy is necessary, but for rough estimates approximate figures may be used.

COOKERY TERMS

Cream: to soften shortening and to blend with sugar by rubbing with a wooden spoon.

Cut in: to blend shortening with flour with pastry blender or two knives.

Dice: to cut in small square pieces.

Fold: to add whipped cream or beaten egg whites with a careful cutting motion.

Mince: to cut or to chop fine

Purée: to press food through a sieve.

Sauté: to cook in a small amount of fat.

Sear: to brown quickly over direct heat or in oven

Shred: to cut or to tear in thin strips.

Simmer: to cook in liquid just below boiling point

Steep: to let stand in hot liquid below boiling point.

CARE OF UTENSILS AND DISHES

Intelligent planning for the use of

* For additional equivalents see Table 8, Part Four

1 liter (by volume)	= 1,000 cubic centimeters (cc.) = 1 06 qts.
1 liter (by weight)	= 1 kilogram (Kg) = 1,000 Gm. = 2.2 lbs.
1 oz.	= 28.34 Gm.
1 Gm.	= 1 cc.
1 tsp.	= 5 cc.
1 tbsp.	= 14 cc. approximately figured at 15 Gm.
2 tbsp. (1 oz.)	= 28 cc. approximately figured at 30 Gm.
1 cup	= 225 cc. approximately figured at 240 Gm.

utensils and dishes and their care after use is a factor in efficient food preparation. This includes the following points:

1. When both dry and liquid materials are to be measured, use the measuring cup first for the dry ingredients, then for the liquids.

2. Rinse cooking utensils as soon as possible. Use hot water for those which have contained sugar, syrup or fat. Wipe greasy utensils with soft paper before rinsing. For eggs or starchy ingredients, use lukewarm water.

3. Wash cooking utensils as soon as possible. This makes meal preparation and dishwashing neater and easier.

4. *When water is hard,* a water softener is recommended before soap is used. A "soapless soap" which is a detergent may replace both water softener and soap.

5. Order of dishwashing: rinse dishes and stack in an orderly pile to the left of sink. *Wash in this order: glass, silver,* small table dishes, then serving dishes. Place washed dishes in drainer and rinse with very hot water, or rinse in very hot water and place on towel. If dishes shine and do not streak, further drying by the towel is unnecessary. Place dried dishes on tray to return to cupboards.

See Bibliography in Part Four for books on Cookery.

CHAPTER THIRTY-FIVE

Beverages

BEVERAGES IN THE MENU

In the opinion of most persons, a meal is incomplete without a beverage, which in its simplest form may be a glass of cold water, chilled with ice if desired. *This is usually part of the service of the* invalid's tray, even if an additional [illegible]

With few exceptions, everyone enjoys a hot beverage on the breakfast table Usually coffee is the choice, and it may also be the preference with other meals Some persons prefer tea at breakfast, but it is more commonly used at other meals. Cocoa is a good choice for the *children's breakfast, especially if a cold* rather than a hot cereal is served. A few older persons take cocoa for breakfast, and may enjoy it, as will the children for lunch or supper For most children, however, milk is the indispensable beverage at every meal.

Coffee and tea have no food value unless served with cream and sugar. Cocoa in itself will increase the food value of the milk which is used in its preparation. Coffee, tea and cocoa all have a certain amount of stimulating power. Generally this is an asset, especially at breakfast time

A cold beverage other than water may be used at any meal, with the exception of breakfast, especially in warm weather. Iced coffee, tea or cocoa, a carbonated beverage or a fruit drink usually is chosen These beverages, however, are used all the year round between meals as a refreshment. Milk, eggnog and other cold beverages made with milk or with *milk and eggs are valuable for serving* between meals when the caloric or the protein content of the diet needs to be increased. Wine and other liquors, which are used occasionally to provoke appetite or to stimulate or flavor, furnish additional calories.

Hot beverages should be hot when they reach the patient and cold beverages cold. The former is particularly important, as a lukewarm cup of a beverage which is supposed to be hot may

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See Bibliography in Part Four for books on Cookery.

Tea contains practically the same constituents as does coffee The principal ingredient is theine, similar to caffeine *Tannin is also found, as well as a small* amount of an essential oil which gives it tea flavor and aroma. It is important that tea should be made just before serving *According to Hutchinson, an English* author, one cup of tea as ordinarily made "contains about one grain of caffeine and twice *or three times as much of tannic* acid." This statement probably refers to the way it is made in England, where it is usually stronger than in this country. *The physiologic effects of tea are much* the same as those of coffee Most persons, however, seem to be less susceptible to the effects of tea than to those *of coffee.*

Herb Teas. Infusions of various herbs are used in beverages and called tea. *With the exception of maté,* from a South American shrub, they are generally lacking in stimulation but are pleasant and refreshing.

Cocoa and Chocolate

Cocoa and chocolate are produced from cocoa beans, which grow in pods from about 5 to 8 inches long upon a tropical (or subtropical) tree They are then dried and bagged and sent to the *manufacturing plant, where they are* cleaned, sorted and roasted. Then they are cracked, and the beans are ground into a thick, oily liquid that is run into molds for bitter chocolate For *sweet* chocolate, sugar is mixed with the mass before cooling and molding. For cocoa, *some of the "butter" is removed before* the liquid is cooled This allows it to be ground into a soft, floury powder that is known as cocoa. Chocolate and cocoa, unlike tea and coffee, have a high nutritive value The roasted beans, and likewise the bitter chocolate, contain approximately 50 per cent fat, about 18 per cent protein, 10 per cent starch and 7 per cent sugar Like tea and coffee *they also contain a stimulant and tannin.* The stimulant, known as theobromine, belongs to the same group of chemical substances as does caffeine and has approximately the same physiologic effects, *though not to such a marked degree* Since only a small amount of cocoa or chocolate is used in making the beverage, there is only a small amount of stimulant in one cup, and the chief nutritive value of the drink lies not in the cocoa but in the amount of milk and *sugar used with it Cocoa should not be* confused with Coca-cola, which is the product of a different plant and contains considerable caffeine

Cold Beverages

Cold beverages may be used with meals or between meals They are more appetizing when chilled, but care should be used in serving an iced beverage to a bedfast patient.

Fruit juices, freshly squeezed, and canned or diluted frozen concentrates are general favorites and are usually allowed. Sometimes combinations of *beaten egg with fruit juices are given.* Eggs may be combined with milk, sweetened and flavored for a variety of so-called eggnogs Milk in its usual form, or as buttermilk or acidophilus milk, is the staple beverage in the invalid diet Malted milks of various flavors may be used *Evaporated milk shaken with fruit* juices and cracked ice is useful in some cases where it is difficult for the patient to take fresh milk Sometimes effervescing waters or ginger ale is well taken by invalids In certain cases they are specifically ordered. Iced tea, coffee and *cocoa may be used between or with* meals in some conditions. The choice of beverage will depend largely upon whether it is given for its food value or merely as refreshment. In any case, a cold drink served between meals adds interest to the monotonous hours in the *daily routine of the invalid.*

Alcoholic Beverages

Alcohol is the product of fermentation of sugar; sugars found in such foodstuffs

ruin the enjoyment of what otherwise would be a good meal.

Coffee

Coffee is obtained from the berry of a tropical tree which bears fruit all the year. The beans are removed from the berry, dried, cured and hulled before they are sent to be roasted in the countries where the coffee is to be consumed.

Blends of various kinds of coffee are used to produce the special aroma and flavor typical of an individual brand. The period of time allowed for roasting also affects the flavor. The roasted beans must be ground in order to allow the water to come in contact with as large a part of the coffee substance as possible. The fresher the grind, the better the flavor of the beverage. As coffee is seldom ground at home today, it should be purchased either freshly ground or in vacuum containers. After a container is opened and the coffee comes in contact with air, loss of flavor begins. It has been found that loss is delayed by keeping coffee in a cool place Theoretically, the finer the grind, the greater the flavor released. The choice of "regular" or drip-grind coffee will depend upon which type of coffeepot is used.

The coffee bean has no caloric value,

given to children.

Caffeine may be removed to the extent of 95 per cent or more. Decaffe-

coffee.

Tannin is another of the soluble products which may be found in the decoction. Unlike caffeine, which is so soluble that it dissolves quickly when liquid comes in contact with ground coffee, tannin requires several minutes for its complete extraction. Long boiling or standing on the grounds brings out a characteristic bitter flavor.

The ordinary cup of coffee, as it is made in the United States, contains from 2 to 3 grains of caffeine. Strong coffee may contain as high as 4 grains per cup, but the amount of tannin will depend largely upon the method by which it is made, as it increases with prolonged cooking

The choice of a brand of coffee is influenced by the blending of different kinds of beans by the distributors, and also by a light or a heavy roast. A heavier roast than that which is liked best for a breakfast beverage may be preferred for after-dinner coffee.

Tea

Tea as a beverage is the infusion made from the leaves of *thea*, an evergreen bush. The smaller and the younger leaves produce the more delicate flavor and, therefore, demand the higher prices. The very tender young leaves at the end of the branches make Orange Pekoe or Flowerly Pekoe tea.

After the leaves are gathered, they are put into trays or upon shelves and allowed to dry or wither in order to reduce the amount of moisture in them. They are next passed through rollers to extract more of the moisture. The masses of rolled leaves are then broken up, and, if green tea is desired, they are then

fermented before they are fired.

A soluble, or "instant," tea is available and has found its most popular use in the preparation of iced beverages. While it may be used in the preparation of a quick cup of hot tea, it is not always acceptable to connoisseurs, who have decided preferences in regard to the type and the quality of tea in leaf form



Fig 89 Coffee should be poured after the tray is ready

of heat in place of the starches and the sugars In cases of collapse, alcohol may act as a quick restorative Like drugs, it never should be given to patients unless it is prescribed by the physician

In its own form, wine, and most commonly sherry or port, is used in the invalid diet Sherry, brandy, whisky and rum are used most often as flavorings for such beverages as eggnog and fruit drinks. Beer or ale may be prescribed in certain high caloric diets, especially when for some reason milk cannot be taken It should be noted that these beverages compare with milk merely in caloric value

GENERAL RULES AND RECIPES FOR BEVERAGES

Coffee

A patient who is fond of coffee will be even more critical than usual with regard to it during illness or convalescence. The use of fresh coffee is important (see p 410), as is the "grind," which should be suited to the type of

ALCOHOLIC BEVERAGES*

	Average Portion	Cal. per Portion	Alcohol Per Cent	Carb. Per Cent	Range of Alcohol Per Cent
Distilled Liquors					
Benedictine	20 cc.	80	42	30	35–50
Crème de menthe	20 cc.	74	36	30	35–50
Brandies	20 cc.	65	45	Sugar sometimes added	35–50
Rum	50 cc.	153	44	.	40–50
Whiskies	50 cc	145	42	.	40–58
Gin	50 cc.	140	40		35–50
Wines					
Champagne	135 cc.	112	10	1–4	9–12
Red	120 cc.	95	12		10–16
White	120 cc.	89	12		10–16
Port	30 cc.	45	17	3–5	15–20
Sherry	30 cc.	42	17	3	15–22
Malt Liquors					
Ale	250 cc.	155	6	5	3–6
Beer	250 cc.	90	4	1	3–8
Cider					
Sweet	250 cc.	70	1	5	1–6
Fermented	250 cc.	130	5	0–13	1–6

* The above table is compiled from a number of authentic sources. There are, of course, differences in composition of various brands, as indicated by the range of alcohol. When it was possible to obtain more than one analysis, average figures were used.

as fruits or sugar produced from starch by a malting process. Alcoholic beverages are of two types: those which are produced by fermentation only, such as ale, beer and most wines, and those in which the fermenting substances are distilled to yield a distillate with a higher percentage of alcohol than can be secured by fermentation only. In alcoholic beverages, the alcoholic concentrations are often increased by fortification or rectification, i e, by the addition of alcohol or strong alcoholic distillates (neutral spirits). By such procedures the alcoholic content of wines which are not distilled may be as high as from 20 to 24 per cent.

Since Federal, and sometimes state, taxes are based on the alcoholic content, the exact amount must be stated on the label of a retail product of a given manufacturer. It may be stated as percentage of alcohol. e g., muscatel, 20 per cent, or as "proof alcohol" content. By this latter method 50 per cent alcohol is called 100 proof, and a whisky labeled "90 proof" would contain 90 per cent of 50 per cent alcohol or 45 per cent pure alcohol For general use see table on this page.

For a time considerable importance was attached to the value of alcohol as a food, owing to the fact that alcohol, when burned, yields energy as heat, although it is not capable of being stored in the body as other food constituents are For this reason it formerly was used sometimes in diabetic diets as a source



Fig 89 Coffee should be poured after the tray is ready.

of heat in place of the starches and the sugars. In cases of collapse, alcohol may act as a quick restorative Like drugs, it never should be given to patients unless it is prescribed by the physician

In its own form, wine, and most commonly sherry or port, is used in the invalid diet. Sherry, brandy, whisky and rum are used most often as flavorings for such beverages as eggnog and fruit drinks Beer or ale may be prescribed in certain high caloric diets, especially when for some reason milk cannot be taken. It should be noted that these beverages compare with milk merely in caloric value.

GENERAL RULES AND RECIPES FOR BEVERAGES

Coffee

A patient who is fond of coffee will be even more critical than usual with regard to it during illness or convalescence. The use of fresh coffee is important (see p 410), as is the "grind," which should be suited to the type of

pot. If possible, a small drip pot should be used to make coffee, especially for the invalid's tray. A proportion of 2 level tablespoons to three quarters of an 8-oz. measuring cup of water is now the accepted proportion. For certain heavier types of coffee, the proportion of water may be increased to 1 cup. A patient may prefer a brew weaker than this. The fineness of the grind also affects the strength of the coffee. A medium "regular" grind is chosen for the boiling and the percolating methods of coffee making, while a finer grind labeled "Drip Grind" should be used for drip and vacuum pots. For after-dinner coffee, a double measurement of coffee is generally used

Boiling. Pour freshly boiling water on the coffee and let it come to the boil Settle with a little cold water, and set aside to steep for 2 or 3 minutes. Broken egg shells may be mixed with the ground coffee before water is added.

Percolating. Pour freshly boiling water over coffee after it has been put in basket. Set over the heat, let boil several minutes after beverage begins to bubble in the glass top. Do not over-percolate. Remove basket containing grounds

Drip Method. Heat pot by rinsing with boiling water or by allowing the separate sections, including cover, to heat around a utensil in which water is being brought to the boil. Adjust basket over lower section and measure coffee

Vacuum Method. *Boil water in* lower portion of coffee "machine." After water boils, adjust upper sections and add coffee. Continue boiling and, when water rises into upper section, stir 30

all returned to lower pot. Remove upper section If the coffee-maker demands the use of a filter cloth, wash and keep under water when not in use.

Decaffeinated Coffee

Procedure: Decaffeinated coffee almost caffeine free is available in vacuum cans and may be prepared by any of the foregoing methods.

Instant Coffee

Procedure: Soluble powdered coffee dissolves instantly in water which has just come to the boil. To allow the coffee to boil for 1 or 2 minutes improves the flavor A caffeine-free powdered coffee is also available.

Iced Coffee

Procedure: Prepare coffee by any of the above methods, using a double proportion of coffee to water, then pour over chopped ice in a tall glass. Add more ice, if necessary, and serve at once with powdered sugar and plain or whipped cream

Tea

Procedure: The proportion of 1 teaspoon of tea or 1 tea ball to 1 cup water is generally used.

Heat the teapot by pouring boiling water into it a few minutes before it is needed. Empty; put tea into the pot. Pour over it water that has just come to a boil and let stand for from 3 to 5 minutes, then serve with lemon, sugar and cream or milk, as preferred A covered pot of boiling water always should be served with the pot of tea on the tray in case weak tea is preferred

Instant Tea

Instant tea, which can be made quickly, is now available It is popular in the preparation of iced tea Follow the directions on the package

Iced Tea

Procedure: Follow directions for making

be added.

Cocoa and Chocolate*

Cocoa

Ingredients:
- 2 teaspoons cocoa
- ¼ cup cold water
- ¾ cup milk
- [illegible]

[illegible] formation of a scum. If preferred, 2 to 3 tablespoons cocoa syrup (*see* below) may be stirred into 1 cup hot milk. Serve with whipped cream Yield· 1 serving

NOTE: An "instant" sweet cocoa mix can be used for both hot and cold beverages, and it is convenient to have on hand. Certain brands contain dry milk solids as well as sugar, others are merely sweetened. Water or milk should be added according to the directions on the package

Chocolate

Procedure: Follow directions for cocoa, substituting ½ square unsweetened chocolate cut in small pieces for the cocoa

Iced Chocolate or Cocoa

Procedure: Follow directions for cocoa or chocolate and cool. Pour over chopped ice in tall glass and serve with whipped cream.

Iced Mocha

Procedure: Combine equal parts of iced coffee and iced chocolate Flavor with vanilla extract or powdered cinnamon to taste. Serve in tall glass with whipped cream.

Cocoa Syrup

Ingredients.
- ½ cup cocoa
- 1 cup cold water
- 1 cup sugar
- ⅛ teaspoon salt
- ¼ teaspoon vanilla extract

Procedure: Mix cocoa and water in 1½-quart saucepan and stir over low heat until mixture thickens and boils. Add sugar and salt, stir until dissolved Boil 3 minutes, add vanilla extract, pour into pint jar and seal After opening, store in refrigerator. This syrup will keep indefinitely and may be used as a flavoring for milk drinks or as a sauce for puddings and ice creams Yield. 1 pint

Milk-and-Egg Beverages*

Eggnog

Ingredients:
- 1 egg
- Salt
- 1 tablespoon powdered sugar
- ¾ cup milk
- 1 tablespoon brandy

[illegible]

Chocolate Eggnog

Procedure: Follow directions for eggnog (*see* above) substituting 1 tablespoon cocoa syrup (above) and ¼ teaspoon vanilla extract for brandy

Molasses Eggnog

Procedure. Follow directions for Eggnog, substituting molasses for powdered sugar.

Orange Eggnog

Ingredients:
- 1 egg yolk
- 2 teaspoons sugar
- ½ cup orange juice
- 1 teaspoon lemon juice
- 1 tablespoon cream
- 1 egg white

Procedure: Beat egg yolk until foamy and [illegible]

* [illegible]



Fig. 90. Banana milk shake

Malted Milk, Hot

Ingredients.

4 tablespoons malted milk powder
¾ cup hot water

Procedure: Moisten malted milk powder with enough hot water to make a smooth paste, then add remaining water gradually, stirring constantly. A little salt or celery salt may be added as seasoning, or 2 teaspoons sugar and a few drops of vanilla extract may be added as a flavoring. Yield: 1 serving

Chocolate Malted Milk

Ingredients.

2 tablespoons malted milk powder
1 tablespoon cocoa syrup
1 cup milk
2 tablespoons cream

Procedure: Mix malted milk powder and syrup, stir in milk gradually, add cream and beat with a rotary egg beater until well blended. Pour over chopped ice in tall glass. Yield: 1 serving



Fig. 91. Tomato juice may be chosen as a breakfast fruit or it may be served between meals.

Molasses Malted Milk

Ingredients:

2 tablespoons molasses
3 tablespoons malted milk powder
1 cup milk, hot or cold

Procedure Blend molasses with malted milk powder Stir in hot or cold milk Beat with rotary beater and serve at once. Yield 1 serving.

Milk Shake

Ingredients:

2 tablespoons sugar
1 cup milk
¼ teaspoon vanilla

Procedure: Mix sugar, milk and vanilla in a shaker or glass fruit jar Add shaved ice Fasten cover tight and shake well. When milk is frothy, strain into tall glass and serve at once

Yield 1 serving.

Molasses Milk Shake

Procedure. Follow directions for Milk Shake, substituting molasses for sugar.

Add cinnamon, mace or nutmeg to taste.

Banana Milk Shake

Ingredients:
1 fully ripe banana

smooth and creamy Add cold milk and mix thoroughly or shake· Yield: 1 large-size drink or 2 medium-size drinks. *For frosted* banana milk shake, add 3 tablespoons vanilla ice cream before serving; for molasses banana milk shake, beat in 2 tablespoons *molasses and nutmeg to taste.*

Milk Punch

Ingredients:
¾ cup milk
1 egg yolk
1 tablespoon sugar
Dash nutmeg and cinnamon
1½ tablespoons rum

ing.

Fruit Beverages

Fruit juices are the usual choice for breakfast. They are much used in their own simple form or as a basis for refreshing between-meal beverages. (For preparation *see* Chap. 39.)

Orangeade

Ingredients:
1 tablespoon sugar
¼ cup water
⅓ cup orange juice
1 tablespoon lemon juice
Procedure: Mix sugar and water in a small saucepan, stir over low heat until sugar dissolves Boil 1 minute and chill Add fruit juices, pour over cracked ice in a tall glass. Yield. 1 serving

Lemonade

Ingredients:
1½ tablespoons sugar
1 cup water
2 tablespoons lemon juice
Procedure: Combine sugar and water, stir *until dissolved. Add lemon juice,* strain and pour over cracked ice in a tall glass Yield: 1 serving.

Egg Lemonade

Ingredients:
1 egg
2 *tablespoons sugar*
¾ cup water
2 tablespoons lemon juice
Procedure: Beat egg and sugar together, add *water and lemon juice. Strain* over cracked ice in a tall glass. Yield. 1 serving.

Mint Fruitade

Ingredients:
1½ cups boiling water
½ cup sugar
2 mint sprigs, crushed
⅔ cup pineapple or grapefruit juice
Juice of 1 lemon
Procedure: Boil water and sugar 3 minutes, add crushed mint. (If fresh mint is not obtainable, use 2 tablespoons dried spearmint.) Let stand from 5 to 10 minutes, strain and add fruit juices. Pour over cracked ice in a tall glass. Yield: 2 servings.

Fruit Yoghurt Beverage

Ingredients:
1 container yoghurt
½ can frozen grape or orange concentrate
Procedure: Beat yoghurt with the frozen juice concentrate until blended Serve in tall parfait glasses or sherbet glasses. Yield· 2 servings

Canned and Frozen Fruit Juices

Canned and frozen fruit juices can be obtained in great variety and are useful in the diet of the patient. The canned *fruit juices may be served* undiluted The frozen concentrates *should be* diluted according to directions on the

be stored in the freezing unit of the refrigerator until they are to be used. Suggested combinations are: pineapple and

grapefruit, orange juice and grapefruit juice, grape and lemon or orange juice, prune with lemon juice. Canned and bottled juices may be combined with frozen juices. Canned tomato juice is largely used. Often a dash of lemon juice is added. For lunch or dinner, it may be served chilled or heated almost to boiling point.

Wine Beverages

Mulled Wine

Ingredients:
1 1-inch stick cinnamon
3 cloves
1 tablespoon sugar
¾ cup boiling water
¾ cup white or red wine

Procedure: Combine cinnamon, cloves, sugar and water in a small saucepan and boil 2 minutes, strain. Add hot mixture gradually to wine and heat. Serve hot. Yield: 1 serving

Wine Cooler

Place ¾ cup white wine in tall glass. Add cracked ice and fill glass almost to top with carbonated water. Garnish with sprigs of fresh mint or with fresh berries or seeded sweet cherries. *Yield: 1 serving*

For suggestions for preparation of highly nutritious beverages, see Chapter 50.

STUDY QUESTIONS

1. Which beverages are considered to be accessory to a meal? Give the reasons for your choice.

2. Outline the principles of preparing coffee as a beverage. Which method *is considered best and why?*

3. Outline the principles of making tea. Give reasons for the choice of this method.

4. List beverages suitable for serving between meals as refreshment. Which of these would supply a worth-while amount of vitamin C?

5. List beverages which may be taken for additional nourishment.

See Bibliography in Part Four for books on Cookery.

Safe Milk
Composition of Milk
Food Value
Digestibility
Milk in the Menu
Use of Milk in Recipes

CHAPTER THIRTY-SIX

Milk

Milk, although not a perfect food, is the best single food which nature provides and the only animal food biologically intended for food. Each animal provides for its young the food adequate [illegible] and the discussion of milk in this chapter will be limited in general to cow's milk. The adaptations which must be made in infant feeding were discussed in Part One, Chapter 13. While milk is particularly important until growth is completed, it is an asset to the diet throughout life.

SAFE MILK

The safety of the milk supply is as important as the safety of the water supply. Many cities and most states have set up standards for cleanliness and bacteria content. All milk must be pasteurized or comply with standards set for what is known as certified milk. Nowhere else in the world is the milk supply as uniformly good as it is in the United States

In the absence of a good supply of pasteurized milk, fresh milk should be pasteurized or boiled at home, or evaporated or dry milk should be used. Evaporated and dry milk are sterilized or pasteurized in factory preparation, in the course of which they lose little of their nutritive value. Large quantities of dry milk were manufactured during World War II for shipment abroad, and the consumer now is profiting from the new and efficient methods of preparation developed during that period.

Most of the dry milk on the market is in skimmed form and sells at a low price. For this reason, its use has increased immeasurably in the last few years. It is also an invaluable source of nutrients when calories must be limited, as in a reducing diet or when fat must be avoided for any other reason. During manufacture, the curd of both the canned and the dry milk is broken up, and for this reason the milk is easily digested For the same reason, doctors advise that fresh milk be boiled when used for infant feeding. Sweetened condensed milk has a higher fuel value than other milk because of the large amount of sugar used in its preparation, but, because of the high sugar content, usually it is not prescribed by the doctor for infant or invalid.

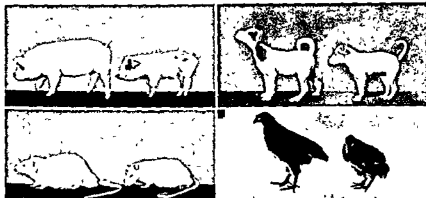


Fig 92. Demonstrates the case for milk. Pigs in the top left-hand picture are female littermates. They were the same size when 3 weeks old. The larger pig had milk added to its food, the smaller animal had no milk. The same is true of the dogs and of the rats and the chicks, which are siblings (National Dairy Council)

COMPOSITION OF MILK

This liquid which we know as milk is a yellowish-white fluid which is a solu-

While a certain minimum amount of fat it desirable and often designated by law, the food value of milk does not depend so much upon that as upon the quality of the proteins, the minerals and the vitamins which are present throughout the whole milk. Contrary to opinion, even skim milk is a more valuable food from the nutritive standpoint than cream. When milk is skimmed, most of the fat and of the vitamin A and a small amount of the riboflavin are removed with the cream, but it still scores high on other counts

The milk of different breeds of cattle varies as to the amount of the total solids and of fat The content of each may vary

Approximate Average Composition of Cow's Milk

	Per Cent
Protein	3.5
Fat	3.9
Sugar	4.9
Minerals	0.7
Water	87.0

State standards usually take into account both the fat content and the total solids. The requirements in general

FOOD VALUE

The test of the nutritive value of a food lies in its ability to satisfy the needs of the body

In nutritive value, milk stands high. For fuel purposes, average milk gives 666 calories a quart. A 2-year-old child needs about 1,200 calories, and the quart of milk which he must have to get the other dietary essentials will give him half the calories that he needs. The fat and the sugar, which with the protein furnish the milk calories, are present in forms which are very easily digested.

The sugar is in the form of lactose, which does not ferment readily or cause digestive upsets, and it also aids in preventing the growth of the putrefactive bacteria which develop in the intestines and sometimes cause digestive disturbances

The quality of the protein in milk is excellent, which means that it contains the amino acids needed to build new tissue. This is invaluable when it is realized how much new tissue a child must build each year until he arrives at maturity. In the first year a baby triples his weight. The quart of milk which the 2-year-old takes will furnish him with enough protein of the best kind. Older children will get more of their protein from other sources. Adults should get some of the amount they need from milk as well as from other sources. It is also important to note that the protein in [illegible]

The mineral substances found in milk are important. The trace of iron present is easily available. Calcium and phosphorus, necessary factors in forming bone, are furnished in large amounts by milk, on which children depend for an adequate supply during the time that the framework of their bodies is being built. A lack of either mineral may cause rickets

In a series of experiments with children from 3 to 13 years of age carried out by Columbia University, 1 quart of milk produced optimum storage of calcium It was observed that even when supplemented with calcium from vegetables, a pint of milk did not produce the same results. Reports show that optimum storage has been obtained on a pint of milk, but only when the children studied were already in good physiologic condition.

Milk is relatively rich in vitamin A and contributes enough thiamine to make it valuable in a diet where it is used liberally. The riboflavin content ranks with that of cooked meats Milk also contributes certain amounts of niacin. The vitamin C content is low and is probably influenced by the period of storage. As milk is such an uncertain source of this vitamin, it cannot be counted upon as a major source of supply.

The vitamin D in natural milk is not sufficient to protect children against rickets. However, it is now common practice to reinforce both fresh and [illegible]

product has found a place for itself in the low caloric diet, as all fat is removed. It can be reconstituted with water instantly for use as a beverage or to replace fresh milk in any recipe. It is not always necessary to reconstitute it, as it may be mixed with the other dry ingredients listed in the recipe and the necessary amount of water added.

Whole dry milk is not in general distribution but is available for infant feeding.

Cream has a fat content of from 18 to 40 per cent, depending upon whether it is sold as "light" coffee cream or "heavy" whipping cream. Comparing food value with cost, cream is much more expensive than milk. In the high caloric diet it may be useful if the fat is well tolerated.

DIGESTIBILITY

Because milk has a high food value and is so easily digested, it is an important factor in the diet of the sick Often it may be prescribed for persons who have been unable, or who have thought they were unable, to take it as a beverage. When the prejudice is merely against the flavor, "chocolate milk"—now generally distributed by dairies—may be well taken, if it is allowed. Homogenized milk, prepared by a process which reduces the size of the fat

globules and makes a more perfect emulsion, is often tolerated better than regular milk.

Sometimes it may be necessary to prepare milk specially for example, to boil it, which makes a smaller curd for digestion, or to mix it with carbonated waters In some cases evaporated or dry skim milk drinks flavored with orange juice or cocoa will be taken more easily than fresh milk. Buttermilk may be preferred to milk in other liquid form and is comparable with skim milk in nutritive value.

Other products which sometimes can be used successfully are yoghurt and junket. In the former the milk [illegible]

[illegible] may be found useful are cream and cottage cheese.

MILK IN THE MENU

Milk a Necessity. It is not hard to convince the majority of people that children must have milk in their diet, although the importance of an adequate amount is not always realized It is not so easy to persuade adults that they, too, need milk Even if they are getting an adequate supply of protein from other [illegible]

[illegible] the use of more laxative foods, the second, by suggesting that a glass of milk be taken instead of a second slice of bread or a second helping of dessert. In a reducing diet it is important that some milk be included, as, when the amount and the variety of food are cut down, special care must be taken to supply the minerals and the vitamins.

How Milk May Be Taken. Milk may be taken in the form of custards, soups, cocoa and other milk dishes; fortunately, milk in such forms is as nutritious as when taken as a beverage. When a specific sensitivity to milk exists, it may have to be omitted, but in that case special care should be taken to keep the diet adequate Sometimes milk in canned or dried form or boiled fresh milk can be taken by those who are allergic to fresh milk. It should be noted also that milk in canned and in dried form is convenient and economical for use in general cookery.

Summation of Value of Milk. The value of milk in the diet may be summed up as follows

Milk contains more food essentials in better proportions than most other foods.

Milk is an excellent source of both calcium and phosphorus.

Though milk contains only a small amount of iron, that amount is in an easily available form

Milk proteins are of the best quality for tissue growth and repair, and are especially valuable as a supplement to the incomplete proteins of grains.

The fat of milk is in an emulsified form and is easily digested

The only carbohydrate in milk—lactose—increases calcium absorption from the intestine and inhibits putrefaction in the colon.

Milk is a good source of vitamin A and riboflavin, and contributes thiamine. It is also an excellent carrier of vitamin D when fortified.

Milk should be considered a necessity, not a luxury, because it furnishes more of the protective food factors for the money than any other food.

USE OF MILK IN RECIPES

Milk is an ingredient in innumerable recipes, such as those classified under Beverages, Desserts and Soups and in other chapters. When used either by itself or as an ingredient of a cold beverage, it is usually desirable to have it chilled. When it is to be served hot, either by itself or as an ingredient, gen-

eral practice is to place it in the top of a double boiler and heat over hot water. This prevents scorching, which injures flavor. Even in a double boiler, milk should not be overheated, as this causes the formation of scum. If scum forms, it may be beaten into the milk with a rotary egg beater

STUDY QUESTIONS

1. Should milk be considered an almost perfect food? Compare the contributions of ½ pint milk with a 6-oz. bottle of a soft drink.

2. The importance of a safe milk supply is recognized. Which forms of milk are safe to use?

3. Discuss the digestibility of milk. If it is not well taken in fresh form, how can this difficulty be overcome?

4. Outline the reasons for use of milk in the family diet.

5. List 10 recipes in which a large amount of milk is called for.

See Bibliography in Part Four for books on Cookery.

CHAPTER THIRTY-SEVEN

Fats, Sweetenings, Seasonings and Flavorings

Fats, sweetenings, seasonings and flavorings are grouped together in this chapter because of their importance in cookery and their contributions to the preparation of good meals. When they are used in combination with other ingredients, they have one or more functions, the most important perhaps being the property which they all share of tying together other foods so that texture or flavor, or both, may be interesting. Among fats, for instance, butter and margarine have a large use as spreads for bread, when their function is somewhat the same as when fat is used as an ingredient of a recipe. Sugar, honey and syrup among sweetenings and salt and pepper among seasonings have common use as accessories at meals

FATS

For their weight, fats have the highest fuel value of any food. Butter and fortified margarine differ from other fats

spreads and shortenings, and as liquid fats, which are known as oils and have their largest use for frying and as an ingredient of salad dressings.

All hard fats share a characteristic

All types of fat are used for frying, but only liquid fats known as oils are used in the preparation of salad dressings. Bland oils, which may be a product of corn, cottonseed, peanuts or soybeans, especially the first two, are more largely used than olive oil for dressings in this country.

Butter

Butter is made from milk fat, which is known as cream. As some moisture and curd remain after the cream is churned, butter generally contains about 85 per cent fat. This gives it a very high

eral practice is to place it in the top of a double boiler and heat over hot water. This prevents scorching, which injures flavor. Even in a double boiler, milk should not be overheated, as this causes the formation of scum. If scum forms, it may be beaten into the milk with a rotary egg beater

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1. Should milk be considered an almost perfect food? Compare the contributions of ½ pint milk with a 6-oz. bottle of a soft drink.

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See Bibliography in Part Four for books on Cookery.

content per unit of weight All have a more or less concentrated caloric value in ratio to their concentration This is highest in sugar and lowest in syrups White sugar, which is highly refined, contributes only calories Brown sugar, maple sugar and syrup, and corn syrup and honey have a very small mineral content, but molasses is considered a good source of minerals, particularly iron. Honey and molasses both contribute small and varying amounts of the vitamins of the B complex.

In order of volume the sweetenings used in food preparation and as table accessories are sugar, molasses, corn syrup, cane syrup, honey, and maple sugar and syrup Of these, honey has perhaps the oldest history, except for the Frigid Zones, its production is world wide. Sap from the maple [illegible]

tapped and the sap concentrated by boiling The juice of the sugar cane also had some use at an early date, but it is only within the last few centuries that methods were developed for producing sugar in the many forms in which we know it today It is only in comparatively modern times that the sugar beet has become a source of the world's sugar supply. It is a still shorter time since methods of extracting sweetening from corn to produce a thick syrup were evolved A small amount of corn sugar is also produced, most of it for commercial use. Some use of dextrose, a form of corn sugar, is made in the invalid diet when it is desirable to increase caloric value without oversweetening a beverage or a dessert.

Sugar has become the staple sweetening since the large volume of production has made it less expensive than other forms of sweetening Sugar from both cane and beets is used in the United States. Both types have the same sweetening power. Most recipes which call for sugar indicate the granulated form, although brown sugar is used to some extent. Both granulated and tablet sugar are used for sweetening coffee and tea. Powdered and confectioners' sugar, both fine in texture, have some use in cookery and on the table

Honey and all forms of syrup have some use in recipes and also as a table accessory for griddle cakes and hot breads There is some use for corn syrup in preparation of the infant's formula. Molasses is used less at the present time as a spread than as an ingredient in cooking

All these products have the power of satisfying appetite. This may be an asset or a liability, depending upon how they are used in the diet The custom of serving a dessert has proved to be good, as it provides the final satisfaction to a meal. On the other hand, sweets should not be eaten to any extent between [illegible]

centrated of sweets, be taken after meals. Dried fruits, in which the natural sugar has become concentrated, are also classified as confections, although they are far less sweet than candy

Artificial sweeteners are in common use today as calorie sparers. They are also used by those who must curtail sugar intake for other reasons These sweeteners are organic compounds which taste sweet but have no food value. The common ones in use are saccharin and the cyclamates (either the [illegible]

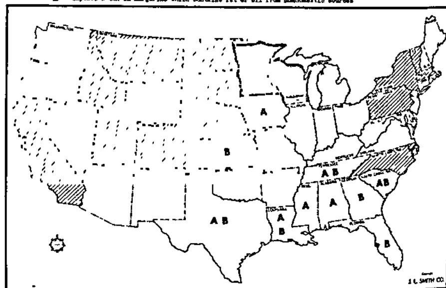


Fig. 93. Showing the situation in the United States with regard to restrictions and taxes on the sale of margarine and to vitamin A enrichment.

fuel value—about 220 calories to the ounce. Fat is digested less quickly than protein or carbohydrate and thus gives satiety value to a meal.

In addition to its fuel value, butter is an excellent source of vitamin A and may contain some vitamin D. The average vitamin A potency of the total output of creamery butter is 15,000 international units per pound. The effect upon the vitamin A content of storage and handling has been found to be negligible.

The quality of butter, of which flavor

favorite spread.

Margarine

Margarine is the term used to cover shortenings which most nearly approximate butter in consistency and in flavor. Public demand resulted in the repeal of Federal taxes on the product and of restrictions on the sale of colored margarine in interstate commerce. State regulations vary, however, in regard to kinds of fats that may or may not be used, and also in taxes exacted on its sale. Only two states prohibit the sale of yellow margarine. In general, the repeal of Federal taxes and the attractive packaging in stick form of most margarines have increased the consumption.

The fuel value is equal to that of butter. While margarines are almost entirely lacking in natural vitamin content, many are now fortified with 15,000 international units vitamin A per pound, and several states make enrichment a requirement.

SWEETENINGS

All forms of natural sweetenings rank next to fat with regard to their caloric

whom food is prepared are an important factor in appetite appeal. In the convalescent diet there is a special need for careful seasoning. Sometimes bland foods are preferable, but even these need a certain amount of seasoning and flavorings to make them palatable. [illegible]

sidered when meals are prepared for him. An intelligent use should be made of the many accessories which add to the interest of food.

STUDY QUESTIONS

1. What properties have fats, sweetenings, seasonings and flavorings in common? In which respects may they differ?

2. How may fats be classified? Outline the specific purposes for which various types of fats are used.

3. Compare butter and margarine for food value.

4. Which products are grouped under sweetenings? Which has become the staple sweetening and for what reason?

5. Which 2 sweetenings have no caloric value? May they be used freely without injury to health?

6. Which seasonings and flavorings are used most? Which has the most important place and why?

7 Discuss the proper use of seasonings and flavorings.

See Bibliography in Part Four for books on Cookery.

use of the noncaloric sweeteners in these amounts is hazardous to health. Actually, most persons who use them make only a partial substitution for sugars, because real sugar is necessary in certain baked products for texture and tenderness They have a large use, however, in certain bottled beverages that supply flavor without extra calories.

When nonnutritive sweeteners are used in cooking, it is well to recognize that saccharine may give a bitter flavor, especially after heating, whereas the cyclamates do not seem to have this disadvantage. Experience teaches a person how much of either type to use, and equivalents are suggested on the labels Suitable quantities are suggested in the low caloric and diabetic recipes given in Chapter 50.

SEASONINGS AND FLAVORINGS

There is no cut-and-dried distinction between the terms *seasoning* and *flavoring*. As generally applied, salt, pepper, herbs and certain spices are considered seasonings, as are such highly flavored foods as onions, cheese and tomatoes. The word *flavoring* generally is used to describe extracts of vanilla, almond, lemon, etc., fresh fruit juices and chocolate and coffee which are combined with [illegible]

[illegible] craving, has the most important place among seasonings. The search for it started as soon as vegetable foods necessarily began to replace a meat diet which satisfied the needs of the body in this respect The first trading posts are believed to have originated at points where representatives of tribes met to exchange hides and furs for the precious condiment. Salt was valued not only for its seasoning power but for the part it played in the preservation of meat and [illegible]

sary savor, although care should be taken not to use it so generously that the natural flavor of foods is injured Also, tastes differ with regard to the amount of this seasoning, and for this reason it is better to undersalt than to oversalt a dish.

When the diet must be salt free or salt low, it is important to make good use of other seasonings. Dishes may be made palatable if the seasonings and the herbs which must be used for flavor are properly blended. For sodium content of spices, see Table 5 and low sodium recipes (Chap. 50). Salt substitutes should be used only when prescribed by the physician, as some of them are harmful. (*See* Chap. 27.)

Next to salt, pepper is the most common seasoning In almost every pantry mustard, ginger, cloves, nutmeg and cinnamon will be found, and perhaps celery salt, curry powder, whole cloves, bay leaf, and other leaf or powdered herbs such as sage, thyme and marjoram Among fresh herbs, parsley and chives are the most commonly used. Onions are always kept on hand, and fresh garlic or salt may be a staple seasoning. Other vegetables such as carrots and mushrooms are often used for their seasoning value. In the broad sense, meat stock and highly flavored fats such as bacon drippings, butter and olive oil may be classified as seasonings. A commercial seasoning, monosodium glutamate, which tends to bring out the natural flavor of foods, is available. It may be used in cooking or as a condiment Lemon juice, vinegar and bottled sauces such as Worcestershire and catsup are also used to add piquancy to food

Among flavorings, vanilla extract is in most common use This may be supplemented by extracts of innumerable flavors, by wine, brandy and rum, by fruit juices and grated orange and lemon rind, and by a variety of spices some of which are also used as seasonings.

Seasonings and flavorings used to suit the taste of the person or the family for



Fig. 94. Cereal is an accepted part of the American breakfast

Most breakfast cereals are cooked wholly or partly at the factory, some cooking in the home kitchen being required in the latter case. The fact that generally these cereals are eaten with a generous amount of milk adds to their importance in the diet.

The cereals are the hard kernels or seedlike fruits of certain plants of the grass family In proximate composition the whole-grain cereals are similar, although the products made from them may vary decidedly in flavor and in texture.

	Per Cent
Water	10 to 12
Proteins	10 to 14
Carbohydrates	65 to 78
Fat	1 to 8
Mineral matter	1 to 2

(Cereals yield from 1,600 to 1,800 calories per lb.)

The seed kernel of the grain plant is composed of three parts germ, endosperm and bran coat. Figure 6, p 22, shows the structure of a grain of wheat and may be taken as typical of all cereals.

Grains in their natural form supply certain minerals and vitamins As most of them are milled for flour and treated in a variety of ways for the production of breakfast cereals, the mineral and vitamin content is greatly reduced The present custom of enriching breads and cereals is believed to be responsible for an improvement in the nutritional health of the American people (*See* Chap 2, p. 27.)

TYPES OF CEREALS

Cereals form the largest crops throughout the world, and cereal foods are present in large proportion in most

Types of Cereals
Food Value
Digestibility
Place in Menu
Preparation
Breakfast-Cereal Recipes
Rice Recipes
Macaroni and Noodle Recipes

CHAPTER THIRTY-EIGHT

Cereals and Cereal Products

The ancient Romans called the goddess of the grains and the harvests Ceres, and from her name the word *cereal* is derived. Because of their widespread cultivation, the comparative ease of transportation, their keeping qualities and the great variety of products which may be manufactured from them, cereals are now one of the great staples of human diet, as they were in prehistoric days, when food was used where is was grown.

In the United States, in spite of the great variety of foods available, cereals form the basis of practically every meal, as they do in most other countries. Cereal habits have changed greatly since [illegible]

mush known as hasty pudding and for the journey-cakes known as johnnycake or hoecake, and for the huge loaves of yeast bread baked in the brick oven usually heated only once a week. Flour was also used for the many pies which during the winter were frozen and used as needed. In some sections of the country, doughnuts were made daily. Later, biscuits were sometimes baked in tin ovens in front of the fireplace, but muffins and fine cakes were not used commonly until a century or so ago, when the kitchen range came into use. Chapter 48 will be devoted to the use of flour in the preparation of baked products in use today. Macaroni and other products of this type made from flour were unknown, but rice was used largely in the South as a vegetable and to some extent in the North for puddings.

The Industrial Revolution brought factory methods of milling flour which produced products of better texture, although at the expense of some minerals and vitamins. Breakfast cereals, even oatmeal, with the exception of the previously mentioned corn-meal mush, which was used as often for supper as for breakfast, were not part of the American diet until about a century ago. Oatmeal was used principally at first for the preparation of gruels for the sick and was sold only in drugstores The modern treatment by cereal manufacturers of grains for breakfast use has brought such products great popularity.

able source of protein when they are used as a supplement to milk and also to other proteins of animal origin, such as meat, fish and cheese A breakfast cereal with milk is largely used, and bread often appears at all three meals of the day. The fact that cereals are among the cheapest foods makes their contribution of protein doubly important

The mineral and the vitamin B complex content of the whole grain are higher than those of milled grains, but eating habits and the fact that whole grains and their products spoil more easily than the refined grains make it impractical to urge universal use of whole

BASIC CEREAL AND MILK BREAKFAST PATTERN*

FOOD ITEM	WEIGHT OF SERVING Gm	PROTEIN Gm.	CALORIES
Fruit or juice	77	0 4	68
Cereal (dry)	30	3 2	110
Toast (2 slices)	50	4 2	130
Sugar	10		40
Butter	10	0 1	73
Whole milk	480	16 8	330
TOTAL		24.7	751

BASIC BACON, EGG AND MILK BREAKFAST PATTERN*

FOOD ITEM	WEIGHT OF SERVING Gm	PROTEIN Gm	CALORIES
Fruit or juice	98	0 5	86
Egg (soft boiled)	50	6 4	79
Bacon	30	4 2	93
Toast (2 slices)	60	5.2	158
Jelly	20	0 1	61
Butter	15	0.1	109
Whole milk	240	8.4	165
TOTAL		24 9	751

* Published by Cereal Institute, Chicago, Ill., 1957.

grains in the general diet For this reason, enrichment of cereal grains, including wheat, rice and corn, is now widespread

The food value of a breakfast cereal is indirectly increased by the fact that a liberal amount of milk is taken with each bowl of cereal A series of experiments conducted at the State University of Iowa, and known as the "Iowa Breakfast Studies," included the comparison of two basic breakfasts Each provides the same calorie and protein content equal to one fourth of a day's requirement. The result showed that the vegetable protein in cereals, when supplemented by the proper amount of milk, was as adequate as the animal protein, and the excretion of thiamine and niacin was at the same level

The contribution of cereals and bread to recommended daily allowances is graphically portrayed in Figure 95, which shows the contribution of 4 servings of these products divided among the 3 meals of the day

DIGESTIBILITY

Cereals are easily digested by the normal person The fact that they are not made ready for absorption as quickly as sugar, the simplest form of carbohydrate, is usually an advantage. For this reason they aid in keeping the stomach filled to the proper point Refined cereals are bland in flavor and in texture, and this may be an advantage in certain conditions Whole cereals, on the other hand, are advantageous in some cases, as they may stimulate the digestion of other products However, the roughage in the form of bran which they contain may be a disadvantage.

PLACE IN THE MENU

Breakfast Cereals. Ready-to-eat cereals and those which need cooking in the home kitchen have a large use at breakfast. The occasional addition of raisins, dates or other dried fruit to a

diets the world over. They are well called the staff of life of every country, whether they are eaten in loaf form or as a boiled or a parched grain. Various racial groups tend to cling to the cereals to which they have been accustomed, as is illustrated by the extensive use of rice by Orientals in countries where wheat is more plentiful The commonly used cereals have certain distinctive characteristics

Barley is used after the germ and the bran have been removed The first form is known as pearled barley. When this is broken up into smaller bits, "instantaneous" barley is obtained, and barley flour is made by grinding the "pearls." Barley water, made from the flour, has *been used a good deal in feeding infants and the sick It contains very little nourishment* but has a soothing influence on the mucous membrane of the digestive tract

Buckwheat is not botanically a cereal, as it does not belong with the grasses, but it serves the same purpose in the diet The bran is removed, and the rest of the kernel is rolled and bolted.

Oat preparations vary little from the original grain In "oatmeal," therefore, is found a concentrated and valuable cereal which scores higher in protein, fat, minerals and most vitamins than any other cereal It loses less between the field and the table than is usually the case with the other cereals

Wheat is the cereal which is more generally used than any other in the United States. It lends itself to breadmaking better than any other grain because of its richer gluten content *It is* also used in various forms for breakfast cereals.

Rye is similar to wheat in most respects but is not used in the United States as extensively as wheat.

Rice, the staple food of the Orient, is used as an accessory food in this country. In its brown, unrefined form, it supplies certain minerals and vitamins which are largely lacking in white rice, the refined product generally used These are also present in wild rice, which comes from a different botanical

initiated. Converted rice has much the same cooking qualities and flavor as the milled rice grain. The moist heat to which it is subjected tends to drive some of the soluble B complex vitamins from the hull into the kernel, so that the B complex in the milled grain is increased. Precooked rice, which is now available in packaged form and needs only to be brought to a boil, covered and allowed to stand 10 minutes, has become increasingly popular.

Corn or maize contains a higher percentage of oil than any other cereal, except oats. Because of its low gluten content, it does not give a flour which can be used well in making leavened doughs. The different kinds of corn are practically the same in composition, although yellow corn has a higher vitamin A content than white corn. Corn meal, cornstarch, samp and hominy are all made from field corn. Corn meal is available in enriched form in some Southern states.

FOOD VALUE

The caloric contribution of cereals

them, both because they are used customarily at every meal and because they are low in cost. Research has shown, *however, that they are more* than a supplement to other foods.

The protein content of grains ranges in general from 8 Gm. per 100 Gm. of uncooked rice to 14 Gm per 100 Gm of uncooked oatmeal. While it is not of such high quality as the protein from animal sources, it has been found that when it is supplemented by even a small amount of milk, it is a good source

Cereals may be regarded as a valu-

tray Ready-to-eat cereals now come packed in a variety package. It should be noted that the roughage content, which varies greatly, may be a factor in the choice of one or another.

Rice, corn meal or hominy and buckwheat grits are used largely in the South and in every other section by certain national groups as accompaniments to meat and as a foundation for main dishes Examples are Southern spoon bread, hominy pudding, Italian polenta and gnocchi, the Russian kasha or buckwheat grits and the general use of rice by all Orientals

Macaroni, spaghetti and noodles are grouped as pastes or "pasta," but they are actually cereal products. A special form of hard wheat is used in their manufacture. From the same paste, macaroni, spaghetti and the even thinner vermicelli are produced For noodles there is an addition of eggs A few of these products are now fortified with extra protein Paste products need only a small amount of cooking in boiling salted water to make them tender, they should not be overcooked They are generally used in combination with a highly seasoned sauce Grated cheese is usually



Fig 96. A baked apple and a ready-to-eat cereal may be used either for breakfast or for a light supper.

CONTRIBUTION OF A BOWL OF CEREAL, MILK AND SUGAR TO DAILY FOOD REQUIREMENT

	Recommended Daily Dietary Requirements*	Supplied by 1 oz. (1 c.) Cereal 3⅜ ozs. (⅜ c.) Milk 1 Tsp. Sugar	Percentage of Total Daily Requirement
Calories	2,300	216	9
Protein	58 Gm.	7.5 Gm.	13
Calcium	0 8 Gm.	.16 Gm	20
Iron	12 mg	1.1 mg	9
Thiamine	1.2 mg	.24 mg.	20
Riboflavin	1.5 mg.	.22 mg.	15
Niacin equivalent	17 0 mg	6 mg.	35

* Based on 1958 Recommended Allowance for women 25 years of age.

to-eat cereals make a good topping or coating for a variety of foods and may be used as a foundation for quick pastry.

So far as food value is concerned, it makes little difference whether a hot cereal or a ready-to-eat cereal from the same type of grain is used. An ounce of one in dried form, whether it is cooked at home or made ready for consumption at the factory, will equal an ounce of another. The preference of a patient for one cereal or another is the first consideration. In general, unless the patient likes the same product day after day, a variety will add interest to the breakfast

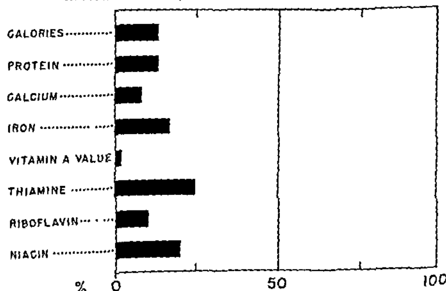


Fig 95. (Agriculture Information Bulletin No 160, 1956)



Fig 98 Equal amounts of rice, cooked and uncooked, showing difference in volume (Institute of Home Economics, U. S Department of Agriculture)

amount of water, just before they are to be used

BREAKFAST-CEREAL RECIPES

Basic Recipe for Cooking Cereal in Small Quantities

Ingredients and time required for cooking are given in the table below

Procedure: Have the water boiling in the top of a small double boiler over direct heat Add salt, then add the cereal very slowly to the boiling water, stirring constantly Boil 5 minutes, stirring constantly Place over hot water in the under part of double boiler Cover and allow to cook the necessary period of time If too dry, add

Oatmeal or Barley Gruel

Ingredients
- ¼ cup rolled oats or whole barley
- ¼ teaspoon salt
- 1½ cups boiling water

Procedure: See general directions for cooking cereals (above) Cook 1 hour Add more water if necessary Strain and serve plain or with cream Yield 2 servings

Barley Flour Gruel

Ingredients.
- 1 tablespoon barley flour
- ¼ teaspoon salt
- 1½ tablespoons cold water
- 1½ cups boiling water

RICE RECIPES

The most common methods of cooking rice are boiling and steaming For the first method, plenty of rapidly boiling water is necessary When the rice is tender, it should be drained, rinsed with hot water, drained again and then placed for a few moments over boiling water or in the oven so that it will be

Directions for Cooking Breakfast Cereals

Kind	Amount of Cereal	Liquid	Salt	Time
Rolled Oats	⅓ c	1 c	¼ teaspoon	15–30 min.
Wheatena	⅙ c	1 c.	¼ teaspoon	15–30 min.
Corn meal	2½ tablespoons	1 c	¼ teaspoon	15–30 min
Other fine cereals	2½ tablespoons	1 c	¼ teaspoon	15 min.



Fig. 97. Hot cereal for breakfast

considered a necessary accessory. While these products are sometimes used as an accompaniment to meat, they often form the main dish of a meal in which a small amount of meat may, or may not, be used. Vermicelli is generally used as an addition to a meat soup, to which it gives body and food value.

Breads and other products made with flour will be discussed in Chapter 48 (Bread, Batters and Doughs). As bread in some form is used at every meal by most persons, it has an important place in the menu.

PREPARATION

Ready-to-eat cereals, usually packed in cartons lined or covered with waxed paper, need no home preparation unless it is some time since the box was opened, when—and especially in warm weather—they may need to be crisped in the oven before use.

Porridge-type cereals such as oatmeal, ground-wheat products and corn meal need a certain amount of cooking with water. Most cereals of this type are precooked under pressure at the factory and, therefore, need only short cooking in the home.

With the availability of modern cooking utensils and ranges equipped with regulated burner control, a double boiler is generally not necessary for cooking. It is usually recommended, however, for cereals such as corn meal, hominy, buckwheat grits, and old-fashioned oatmeal and for the preparation of gruels which have not been cooked at the factory. If the latter are to be served several days in succession, the small recipes listed below may be doubled or tripled. After straining, the gruels may be covered and stored in the refrigerator. They may be reheated, with the addition of a small

Baked Macaroni with Tomato

Ingredients
- ½ cup broken or elbow macaroni
- 1 tablespoon butter
- 1 teaspoon minced onion
- 1 teaspoon minced green pepper
- 1 teaspoon minced celery
- ⅔ cup canned tomatoes
- ¼ teaspoon salt
- 2 tablespoons soft breadcrumbs
- 1 teaspoon melted butter

Procedure: Cook macaroni in boiling salted water until tender (from about 8 to 10 minutes) and drain Melt butter, add onion, green pepper and celery, and cook 2 minutes over low heat Add tomatoes, salt and drained macaroni Blend well, add more salt if necessary, and place in a small greased baking dish Mix breadcrumbs with 1 teaspoon melted butter and sprinkle over macaroni Bake in a moderate oven (350° F.) [illegible]

Spaghetti Preparation

Procedure. Cook spaghetti according to directions on package and dress with well-seasoned tomato sauce Serve with grated cheese, preferably of the Parmesan type

Noodles with Browned Crumbs

Procedure: Cook one sixth of the contents of a package of noodles as directed on package and drain. Melt 2 teaspoons butter, [illegible]

serving

Noodles with Cheese Sauce

Procedure: Cook one sixth of the contents of a package of noodles as directed on package and drain. Prepare half the recipe for rich cheese sauce (*see* p 503) and toss noodles into this mixture Yield. 1 serving

Other Suggestions for Noodles

[illegible]

STUDY QUESTIONS

1. Outline the changes in cereal consumption from Colonial times to the present.
2 Which grains are used most commonly in the United States today?
3 Compare the nutritive contributions of an average serving of cooked oatmeal with those of an average serving of a ready-to-eat cereal.
4 Which type of cereals should be used when roughage must be avoided? Which cereals when roughage is an advantage?
5 Discuss the nutritive contribution made by cereals in general.
6 Which cereal products are known as pastes? From which grain are they prepared?
7 In which circumstances is it advisable to cook the porridge-type cereals longer than the directions on the package advise?

See Bibliography in Part Four for books on Cookery.

[illegible]

use as a dessert, or when it is desirable to obtain a very tender texture. Another method now recommended is to place the rice in twice as much salted water, cover, bring to a boil over high heat, then continue cooking about 15 minutes over very low heat. Precooked rice should be cooked according to directions on the package. If rice is to be served with meat, it may be cooked a few minutes in butter, oil or other shortening before water is added.

Boiled Rice—Method I

Ingredients:
- ¼ cup rice
- 3 cups boiling water
- ½ teaspoon salt

Procedure: Look over rice and wash thoroughly. Add slowly to boiling salted water. Boil actively about 20 minutes until tender. Place in strainer, rinse with hot water. Cover with a towel and place over boiling water to fluff. Yield: 1 serving.

Boiled Rice—Method II

Procedure: Combine rice with twice as much cold salted water. Cover and bring to a boil. Reduce heat to low and simmer about 15 minutes.

Steamed Rice

Ingredients:
- ¼ cup rice
- ¼ teaspoon salt
- ¾ cup hot milk

[illegible] is tender. [illegible]

Baked Rice and Cheese

Ingredients:
- ½ cup cooked rice
- ½ cup cream sauce (p. 503)
- ¼ cup grated cheese
- 2 tablespoons soft breadcrumbs
- 1 teaspoon melted butter
- ¼ teaspoon paprika

Procedure: Mix rice lightly with hot cream sauce and grated cheese. Place in small greased baking dish. Mix breadcrumbs lightly with melted butter. Place on top of [illegible]

Baked Rice with Tomato

Ingredients:
- ½ cup cooked rice
- 1 teaspoon minced onion
- 1 teaspoon minced parsley
- ¼ cup condensed tomato soup
- 1 tablespoon grated cheese

Procedure: Mix rice with onion, parsley and tomato soup, and place in a greased individual baking dish. Sprinkle with grated cheese and bake in a moderate oven (350° F.) about 10 minutes until cheese is melted. Yield: 1 serving.

MACARONI AND NOODLE RECIPES

Macaroni, spaghetti and noodles, often known as pastas, should be cooked in plenty of boiling salted water until tender but not too soft. They should be drained, rinsed with hot water and drained again before being used as a foundation for a dish. Time of cooking will vary slightly with the brand of product used, and for this reason directions on the package should be followed.

Baked Macaroni with Cheese

Ingredients:
- ¼ cup broken or elbow macaroni
- ½ cup grated cheese
- ½ cup cream sauce or milk
- Salt
- Pepper
- 1 tablespoon butter

Procedure: Cook macaroni in 2 cups boiling salted water from 8 to 10 minutes (until tender). Drain and arrange in small greased baking dish. Sprinkle with salt, pepper and cheese, and add cream sauce or milk to cover marconi. Dot with butter and bake in moderate oven (350° F.) until cheese is melted and slightly brown, from about 15 to 20 minutes. Yield: 1 serving.



Fig 99. A refreshing fruit salad

constitution should be stored in the freezing compartment of the refrigera- [illegible]

[illegible]

frozen After reconstitution, flavor will be retained for at least 24 hours with only a slight loss of ascorbic acid if the container is covered.

Vitamin A. Most fruits supply vitamin A in varying amounts The best sources are apricots, cantaloupes, yellow peaches and prunes, all of which show [illegible]

[illegible]

Mineral Content. Fresh fruits are comparatively low in minerals, but in general they supply an appreciable amount of iron Dried fruits, because of the removal of water, are more concentrated sources of all factors. When they are soaked and cooked, they return to the approximate composition of fresh fruits For fruits, fresh or dry, the most iron is found in apricots, avocados, bananas, dates, figs, grapes, raisins, prunes, raspberries and strawberries.

Caloric Value. The caloric value of fruits is comparatively low, and chiefly from carbohydrates, usually in the form of sugar. Dried fruits are high in calories, even after their water content is restored The caloric value of canned fruits and frozen fruits is increased according to the amount of sugar used in their preparation The avocado pear and the olive are distinguished from all other fruits by their high fat content, which gives them a comparatively high caloric value.

Digestibility

Fruits are easily digested by normal persons. The sugar content is in the form of glucose and fructose, which are ready

CHAPTER THIRTY-NINE

Fruits and Nuts

Fruits and nuts have been grouped for discussion in this chapter because of their botanical relationship. As they have little in common in regard to food value or use in the menu, their functions as food will be considered separately.

FRUITS

Fruits make a strong appeal to the appetite through the senses of sight, smell and taste. Shape, color, delightful aroma and delicious flavor all contribute to popularizing this group of foods and to making it easy to find a place for them on the menu, to which they contribute nutritionally.

Food Value

The most important contribution of fruit to the diet is its vitamin content, particularly ascorbic acid, commonly known as vitamin C, which is supplied by fresh fruits in varying amounts Clinical experience indicates that many adults in the United States do not get enough of this vitamin, more often because of lack of appreciation of its value and food sources than of its cost.

Ascorbic Acid. The best sources of ascorbic acid are fruits of the citrus family, tomatoes, cantaloupes and strawberries Papayas, guavas and acerola cherries grown in Florida, Hawaii and Puerto Rico are exceptionally high in vitamin C content. While fruits such as apples, pears and grapes do not contribute largely, they may be a significant source if eaten liberally in raw form. During cooking and canning there is a varying loss. In general, there is a good retention A comparison of the average amount of ascorbic acid content of canned fruit juices with that of fresh orange juice is shown by Figure 100.

Frozen fruit juice concentrates prepared by a high vacuum process compare well with fresh juice Orange juice after reconstitution with water may average nearly as high as the fresh juice, depending upon the month in which it was packed.

Frozen fruit concentrates before re-



Fig. 101. Preparation of grapefruit for salad.

fruit and oranges may be combined with other fruits for a compote

Preparation

Fresh Fruits

Large fruits such as apples, pears, peaches, plums, oranges and grapefruit should be washed in order to remove any traces of spray which may be pres- [illegible]

be served [illegible]

erator until just before serving, when they should be washed thoroughly to remove spray and drained well after washing Strawberries should be hulled, unless they are to be served whole around a mound of sugar Grapes and cherries should be washed thoroughly and drained as dry as possible.

Melons should be ripe but not overripe They should be chilled and prepared just before serving Cantaloupes should be sectioned, other melons cut in slices, and the seeds carefully removed. Sliced lime or lemon may be served with honeydew or casaba melon.

Peaches. Peaches, if ripe, should be kept in the refrigerator If green, they should be allowed to ripen at room temperature. If they are to be served whole, they should be washed and dried If

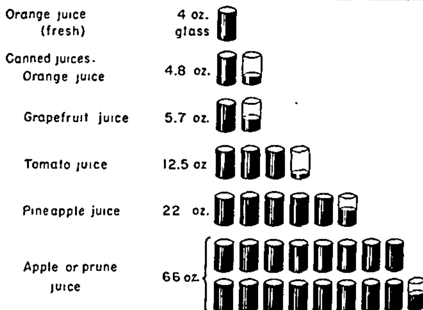


Fig. 100 Amounts of canned fruit juices necessary to supply the same amount of vitamin C as 4 ozs. of fresh or frozen orange juice (two thirds of day's requirements).

for immediate absorption and thus require no digestion in the alimentary tract With color, odor and flavor all combining to whet the appetite and, therefore, stimulate the flow of the digestive juices, digestion and absorption are naturally rapid

Fresh fruit should be ripe, but not overripe. Bananas, when the skins are flecked well with brown, may be used even in the diet of children and invalids. For infants they should be mashed or strained Certain fruits which are not well tolerated in raw form are easily digested when cooked

Seedy berries and apple skins are not always well taken, as they may be irritating to some persons

Place in the Menu

The custom of serving fruits twice a day, for breakfast and at some other meal, is good standard nutrition practice. It applies in illness as well as in health if there is no therapeutic reason, which there seldom is, against it. The appetite of a patient may often be tempted more by fruits than by any other type of dessert, and, as fruits need little preparation, this will often be a convenience. Use may be made of a large variety of fresh, frozen, canned and cooked dried fruits according to their availability in the market.

Generally, a citrus fruit is chosen for breakfast. For lunch or dinner, another type of fresh fruit or some cooked or canned fruit may be served unless the patient prefers a citrus fruit more than once a day. In this case, orange juice might be offered for breakfast and grapefruit in the fresh or broiled form for dessert at another meal. Both grape-

careful not to cut pulp, then loosen each section of skin carefully and turn in toward fruit.

Recipes

Raw Fruits

Fresh Fruit Compote

Procedure. A combination of fresh fruits is known as a compote or a cup. The fruits should be put together and sweetened with

be topped with a tablespoon of lemon, orange or pineapple ice

Ambrosia

Avocados

Procedure Select ripe avocados which are slightly soft to the touch The skin of a ripe avocado is usually dark green Prepare fruit just before ready to serve so that flesh will not darken Cut in half, remove pit Serve without paring with lemon juice or catsup in the cavity as a first course Pare and slice for use in salads or dice for fruit cup

Cooked Fruits

Apple, Baked

Ingredients

cinnamon or nutmeg and fill apple with

glazed by sprinkling with sugar and placing under the broiler a few minutes until sugar melts Serve hot or cold. Yield· 1 serving

NOTE If practical, bake several apples at the same time

Applesauce

Procedure. Wash, core and slice 2 tart

Stewed Apples

Ingredients.

2 cooking apples, medium size
¼ cup sugar

low heat until sugar is dissolved Add cinnamon or nutmeg Drain apples, and cook in syrup until transparent Add boiling water to syrup if it thickens during cooking Serve hot or chill before serving Yield. 2 servings

NOTE A few cinnamon drops will give flavor and color

Banana, Baked

Procedure· Peel banana, place in shallow

If used as dessert sprinkle cooked banana with lemon juice and powdered sugar

Grapefruit, Broiled

Procedure· Wash and dry grapefruit, and cut in halves crosswise. Remove seeds, loosen pulp in sections and remove center cores Place fruit in baking pan, sprinkle each half with 2 tablespoons brown sugar and dot with 1 teaspoon butter Broil 6 inches from low broiler heat about 15 minutes

NOTE· Add 1 tablespoon of wine or rum to each half, if desired.

they are to be served sliced, they should *be peeled and sliced just before they are* to be served. Sprinkling with lemon juice will delay change in the color which is caused by exposure to air. They may be sprinkled with sugar at time of slicing, or sugar may be passed with them.

Pears. Pears, if ripe, should be washed and placed in the refrigerator. Otherwise they should be allowed to ripen at room temperature. They are generally served whole and unpeeled. A large juicy pear of the Comice variety may be halved just before it is served if desired.

Pineapple. Pineapple should be kept at room temperature. The easiest method of preparation is to cut the fruit in thick slices, pare each slice and then shred with a fork. Sugar is generally necessary, and the flavor will be improved if it is added to the shredded fruit half an hour before serving. It should then be allowed *to stand at room temperature, not in the* refrigerator. The fruit may be cut in wedges and served around a mound of powdered sugar.

Citrus Fruits. Oranges and grapefruit are used for table service more than any other type of citrus fruit, as they are in season throughout the year. Tangerines are available during some of the

in wedges. For either purpose, the seeds should be removed. The squeezed juice of either often serves as a flavoring for cold drinks and some desserts and sauces Citrus fruits are usually stored in the refrigerator, *although they will* keep some time at room temperature. There is, however, a general preference for chilled citrus fruit.

Oranges are served in juice form more often than any other. Fresh grapefruit juice is sometimes used. Both should be chilled in the refrigerator before they are cut and squeezed Ice should not be put in the juice as it dilutes it. While the juice can be stored *in the refrigerator for a time without* changing nutritive value, flavor will change with too long storage Fresh orange juice is now offered in many markets. If juice must be strained, a coarse strainer is recommended to remove seeds, as a goodly proportion of the vitamin C remains in the pulp.

Frozen juice concentrates should be stored in the freezing compartment of the refrigerator. After thawing, the concentrates should never be refrozen. The contents of a can should be diluted with three times as much water. One third of the standard size 6-oz. can, enough for one serving, may be diluted and the remainder of the still frozen contents returned to the freezing compartment. In order to incorporate air, the diluted juice should be stirred or shaken in a covered container. After reconstitution, flavor will be retained for at least 24 hours.

Large oranges and grapefruit may be served in the shell after they are halved and the segments have been loosened. To prepare, run a sharp knife between the peel and the pulp and loosen the segments from the fiber which separates them but do not cut the fiber partitions. As citrus fruits have a large amount of natural sweetness, they should be served without sugar. Sugar may be added if desired Both oranges and grapefruit may be served in sections by themselves or in combination *with other* fruits as a compote or in salad. They should be pared deeply enough to remove the inner fiber of the skin, after which the sections may be lifted out *without destroying the shape. Seeds, if* present, should be carefully removed Navel and Valencia oranges, which are free or almost free of seeds, may be pared and sliced. These oranges and tangerines are sometimes served whole after the rind has been sectioned and turned back around the *fruit To sec-*tion the rind, run a sharp knife 5 or 6 times from stem to blossom end, being

commonly used are peanuts, walnuts, pecans, almonds, cashews and Brazil nuts. Coconut, especially in dried, shredded form, is also largely used.

Food Value

The protein content of nuts is generally high, although there is a wide range in this, as will be seen by consulting the Table of Percentage Composition. The protein is of good quality, although not equal in every respect to that furnished by animal products such as meat, milk, fish, cheese and eggs. With the exception of chestnuts, which are low in fat as well as in protein, the fat content is exceedingly high, and the oil obtained from peanuts and coconut has a larger use than these products in their own form. Most nuts are good sources of the vitamins thiamine, riboflavin and niacin. They contribute the minerals calcium, phosphorus, iron and copper in varying amounts according to the particular nut. Among the nuts in everyday use, almonds and Brazil nuts furnish the most iron.

Digestibility

Because of the high fat content, nuts digest slowly. Chopping or grinding improves digestibility. In the form of nut butter and combined with other foods, there is usually no digestive difficulty. Peanut butter may be used in sandwiches or as an ingredient of a dish.

Use in the Menu

In general, nuts are considered an accessory to a meal, except in the vegetarian's diet, when it is necessary to draw protein from all vegetable sources. Peanut butter is the only form in which nuts are used as a staple part of a meal. Chopped nuts are often used in cakes and in cookies, and as a flavor or a garnish for various types of puddings and other desserts. They may occasionally be used as a topping for creamed dishes and vegetables or as an accessory to them. As nuts are used so little in the invalid's diet, no specific recipes accompany this chapter.

STUDY QUESTIONS

1. For what reason have fruits and nuts been grouped together for discussion in this chapter? Compare their nutritive contributions.

2. What are the most important contributions of fruits to the diet? List the best sources of ascorbic acid; of vitamin A.

3. List the fruits which supply appreciable amounts of minerals.

4. Discuss the place of fruit in the menu.

5. What are the 3 most valuable nutritive contributions made by nuts?

6. Compare the digestibility of nuts with that of fruit.

7. Discuss the use of nuts.

See Bibliography in Part Four for books on Cookery.

Pears, Stewed

Ingredients:
- 2 pears, medium size
- 6-8 cloves
- ½ cup sugar
- ½ cup boiling water

Procedure: Wash fruit and pare Stud each pear with cloves and arrange in shallow saucepan Sprinkle with sugar. Add water Cover and cook over very low heat until tender when tried with a toothpick. Serve hot or cold Yield. 2 servings.

Plums, Stewed

Ingredients:
- 8 plums
- Water
- ¼ cup sugar

Procedure: Wash plums and prick with fork Place in small saucepan and add water to half cover Cover and cook over low heat about 10 minutes (until soft). Add sugar Stir carefully into syrup and cook uncovered about 2 minutes, until syrup thickens slightly Yield. 2 servings.

Rhubarb, Stewed

Ingredients:
- 1 lb rhubarb
- ½ cup sugar

Procedure: Trim rhubarb, removing leaves and stem ends of stalks. Wash and cut in 1-inch pieces Place with sugar in top of double boiler and cook, covered, over hot water, until rhubarb is soft Yield: 3 servings.

Dried Fruits

Dried fruit should be washed thoroughly. Unless directions on package state otherwise, soak in just enough water to cover for several hours. Cover and cook over low heat in the water in which it was soaked until the fruit is soft. Add sugar to taste, stir until dis- [illegible]

their own form or are used as an ingredient in a dessert.

Canned Fruits

Canned fruits should be thorou chilled before serving. Any fruit ma served in its own syrup or comb with another fruit, fresh or canned. gested combinations are canned cots and canned cherries; sliced pea and pineapple wedges, sliced ora and cherries.

Canned Fruit Juices

Canned fruit juices have grown variety and popularity in the last years Grapefruit juice and tomato j are staple products. Pineapple ju

on the invalid's tray. Canned or juice has improved greatly in fl under modern conditions of packin may be obtained in combination grapefruit juice It should be noted some of the fruit juices are obtain with or without sugar. The label on can gives this information. Like f fruit juices, the canned fruit juices not lose vitamin C content quickl they are refrigerated after the cans opened, but storage may have an ef on flavor. Fruit juice may be store the can without undesirable results.

Frozen Fruits

Frozen fruits should be stored in freezing compartment unless they ar be used within a few hours They be thawed gradually on the shelf of refrigerator or more quickly at ro temperature They should never refrozen

NUTS

The word *nut* is defined in the tionary as "a dry fruit or seed havin separable rind or shell and interior nel or meat." All the products cal nuts fall under this definition, except peanuts, which, instead of being fruit of a tree, are tubers, the und ground product of a vine. The nuts m



Fig 102. Poached eggs on toast ready for a meal.

the stomach as well as in the intestines, which is of advantage in certain dietary disturbances

Unless there is an allergy to eggs, they will seldom cause any digestive disturbance, whether they are served in raw or in cooked form The yolk of the raw or the hard-cooked egg may be added to the infant's food formula at a very early stage, particularly because of its iron and vitamin potency. The [illegible]

PLACE IN THE MENU

It is not a difficult matter to find a place in the diet for eggs, even when there is a prejudice against them They can be disguised easily in sauces, desserts and other "made" dishes. In the event that eggs must be eliminated completely from the diet, which, fortunately, is rare, care must be taken to supply other foods high in the same nutrients *In general, however, eggs will be found to be one of the most important constituents of the nourishing and easily digested diet so important in convalescence* Combined with milk or fruit juice, *they are used in a liquid and a semi-liquid diet*, and the first solid food is often an egg in soft-cooked or poached form. Scrambled eggs and omelet follow. Later, combinations of poached or boiled eggs with savory sauces may ap-

CHAPTER FORTY

Eggs

Egg production has increased largely and consistently in recent years This has been accomplished through modern scientific production, which has resulted in a greater number of eggs per hen without material increase in size of flocks.

The ideal standard is 1 egg a day if possible *Unless there is an allergy to* eggs or unless for any reason the physician orders them to be omitted, eggs have an especially high place in the diet for a number of reasons. They are well liked by almost everyone. Nutritionally they score well. They are easily digested, are quick to prepare, and can also be used as an ingredient in many dishes.

FOOD VALUE

The food value of eggs can be most fairly estimated by comparing them with meat and milk They score slightly higher than meat on most counts The protein, as would be expected from an animal food, is of the same high quality as that of meat and milk.

In iron *content, eggs equal meat* They supply vitamin A and riboflavin and a small amount of thiamine When eggs are cooked, approximately 20 per cent of thiamine and riboflavin is lost. Eggs are a poor source of vitamin C and niacin

Most of the food value of the egg other than protein is concentrated in the yolk, in which most of the minerals and the vitamins are to be found. Both yolk and white contain protein, but the fat content is to be found in the yolk alone

AVERAGE COMPOSITION

While eggs *differ in* size, and for this reason in food value, 1 average egg does not differ materially from another in composition There should be no prejudices in favor of either brown or white eggs. In spite of the fact that *Bostonians* will pay 10 cents a dozen more for *brown eggs* and *that New Yorkers* will do the same for white eggs, there is no difference *in* food value or in flavor. The color of the yolk may vary with the ration of the hens, the theory that highly colored egg yolk necessarily contains more vitamin A is not based on sound scientific evidence

DIGESTIBILITY

Eggs are easily digested by almost everyone, whether in raw or in cooked form The fat is in an emulsified state like that of milk and can be digested in

remain at room temperature for some time

Low temperature and short cooking are desirable for most egg dishes, as the

by being allowed to stand covered in water that has been brought to the boiling point. Hard-cooked eggs, prepared

be eaten

RECIPES

Coddled Eggs

Procedure. Place 2 cups boiling water in

ance of about twice as much time as for boiled eggs must be made for coddled eggs. A 3-minute boiled egg will be about the same firmness as one coddled for 6 minutes. If eggs are taken directly out of the refrigerator, allow 1 extra minute for coddling

Hard-cooked Eggs

Stuffed Eggs

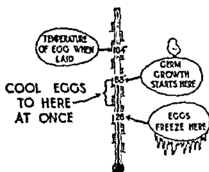


Fig 104 Critical temperatures of eggs in the shell. (U. S. Department of Agriculture)

paste may be added. Refill whites with mixture and sprinkle with paprika or minced parsley. Allow 1 egg for each serving

Poached Eggs

Procedure: Place boiling water to the depth of 1 inch in a skillet. Add dash of salt. Break each egg into saucer, slip egg into boiling water. Remove from heat, cover, let

Eggs Poached in Milk

Procedure: Follow preceding directions for poached eggs, substituting hot milk for water. Serve eggs on toast and pour hot milk over them.

Eggs Poached in Butter

Procedure: Place 1 teaspoon butter in a small frying pan and melt over low heat. Break each egg into saucer and slip into frying pan. Remove from heat, cover, let stand about 5 minutes (until eggs are firm). If a harder egg is desired, let stand over low heat 1 more minute.

Poached Egg with Cheese Sauce

Ingredients
- ¼ lb grated cheese (¼ cup)
- ¼ cup evaporated milk
- 1 slice toast
- 1 egg, poached
- Salt and pepper to taste



Fig. 103. Poached egg with cheese sauce.

pear on the invalid's tray for lunch or supper.

Fresh eggs of the best quality should ... appear ...

patient against this valuable ... places which grade eggs before marketing, Grade AA or A quality should be chosen whenever eggs are to be served in their own simple form. Grade B eggs ... satisfactory for use as an ingredient ... fresh ...

and packaged for shipment ... at some distance may pass the "candling" test better than an egg only a few days from the nest but not subjected to immediate cooling. Good-quality eggs, under proper storage conditions, will pass the Grade A test after some time in cool storage. Size, by the way, is not a basis for grading.

For commercial use shelled eggs have long been frozen or dried. Flavor and cooking quality deteriorate during storage, and for this reason there is only small retail distribution. Both frozen and dried eggs are used largely by bakers and confectioners.

PRINCIPLES OF COOKERY

As soon as eggs come from the market they should be placed in the refrigerator in the carton in which they are packed, unless there is a special compartment for egg storage. Good-quality eggs have clean shells and should not be washed before storage, as washing removes the ... coating. Eggs should ... be- ... hen ... ake, ... with ... d to

Creamed Eggs

Ingredients:

- 1 tablespoon butter
- 1½ teaspoons flour
- ¼ teaspoon salt
- Dash pepper
- ½ cup milk
- 1 hard-cooked egg

Procedure. Melt butter in small saucepan, add flour and seasonings, stir until smooth. Stir in milk slowly and cook over low heat, stirring constantly until sauce thickens and boils. Shell and slice hard-cooked egg, add to hot sauce, reheat and pour over slice of buttered toast. Garnish with minced parsley. Yield. 1 serving

NOTE: A dash of Worcestershire sauce or 1 teaspoon of ketchup may be added to the cream sauce after it has thickened.

STUDY QUESTIONS

1. Compare the food value of eggs with that of milk and meat.
2. Discuss the digestibility of eggs.
3. Outline the principles of egg cookery.
4. List a few simple recipes for cooking eggs suitable for use in the early stages of [illegible]

See Bibliography in Part Four for books on Cookery.

[illegible]

Plain Omelet

Ingredients:
- 2 eggs
- ¼ teaspoon salt
- Dash pepper
- 2 tablespoons water
- 1 tablespoon butter

Procedure: Beat eggs until well blended. [illegible] spatula from handle of frying pan to outer edge Slip onto a hot plate and garnish with parsley Yield. 1 serving

Foamy Omelet

Ingredients:
- 2 egg yolks
- 2 tablespoons water
- ¼ teaspoon salt
- Dash pepper
- 2 egg whites
- 1 tablespoon butter

Procedure: Beat egg yolks with water and seasonings until very foamy Beat egg whites until stiff and fold into first mixture. Melt butter in small frying pan, add omelet mixture and shake over low heat until omelet is slightly brown on the bottom. Test by lifting with spatula Place frying pan in moderate oven (350° F.) about 5 minutes (until omelet is dry on top). Remove from oven and make a shallow cut through center at right angles to handle, fold and slip on to hot plate Yield. 1 serving.

Scrambled Eggs

Ingredients.
- 2 eggs
- 2 tablespoons milk or cream
- ¼ teaspoon salt
- Dash pepper
- 1 tablespoon butter

Procedure· Beat eggs just enough to mix yolks and whites, stir in milk or cream and seasonings. Melt butter in small frying pan or in top of double boiler. Stir over low heat or hot water as eggs become firm Stir only enough to prevent eggs sticking to pan. Serve at once. Yield· 1 serving

Shirred Eggs

[illegible] buttered soft bread crumbs and bake in moderate oven (375° F.) about 15 minutes (until eggs are firm). Yield· 1 serving

Baked Eggs with Cheese

[illegible] cheese. Add top milk just to cover eggs and bake in moderate oven (375° F.) about 15 minutes (until eggs are firm). Yield 1 serving

Baked Eggs Espagnole

Procedure: Break 1 or 2 eggs into a small, shallow, greased baking dish. Sprinkle with minced onion and minced green pepper Add condensed tomato soup just to cover eggs and bake in a moderate oven (375° F) about 15 minutes (until eggs are firm) Yield. 1 serving

Baked Eggs, Savory

Procedure: Break 1 or 2 eggs into a small, shallow, greased baking dish. Sprinkle with minced ham Cover with buttered soft crumbs and bake in a moderate oven (375° F.) about 15 minutes (until eggs are firm). Yield. 1 serving

Baked Eggs with Spinach

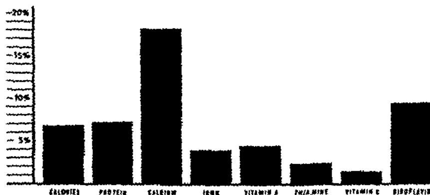
Procedure. Line a small, shallow, greased baking dish with well-seasoned chopped cooked spinach Break 1 or 2 eggs on the spinach Sprinkle with salt and pepper, and minced onion if desired Add top milk just to cover eggs and bake in moderate oven (375° F) about 15 minutes (until eggs are firm). Yield: 1 serving

CHOCOLATE PUDDING

(MADE WITH MILK)

½ CUP

200 CALORIES



CONTRIBUTION TO DAILY FOOD NEEDS OF AN ADULT

Figure 105

custards, gelatin desserts and ice cream may all appear on the patient's tray, but there is seldom any reason for serving rich puddings and pies.

Small portions are usually more acceptable than large ones, as, when appetite is poor, the very sight of a large portion may be unappetizing.

Serving dishes for desserts should be chosen carefully. Plates for cold desserts should be chilled and for hot ones should be warmed.

Garnishes for desserts should be simple and of contrasting color.

RECIPES

Fruit Desserts

Classified under fruit desserts are whips, soufflés and creams, which are combinations of strained fruit pulp with eggs or whipped cream, and baked fruit puddings for which sliced fruit is combined with bread or a rich dessert dough. The desserts in the first group are light, in the second, heavier.

Fruit Whips. A fruit whip is a combination of beaten egg white and sweetened fruit pulp. Stewed prunes or apricots, applesauce or fresh strawberries, raspberries or peaches may be used. The amount of fruit necessary for a whip will vary with the amount of juice combined with the pulp. The final product should be stiff enough to hold its shape and should be served in a sherbet glass. A custard sauce or whipped cream may be served with a whip.

Basic Recipe for Fruit Whip I

Ingredients:

1 egg white
Dash salt
2 tablespoons sugar
¼ cup strained cooked fruit pulp or ¼ cup strawberries or raspberries, crushed and sugared
1 teaspoon lemon juice

Procedure: Beat egg white with salt until stiff, add sugar, fold in fruit pulp and lemon juice. Add more sugar, if necessary, and pile in sherbet glasses. Yield: 2 servings.

CHAPTER FORTY-ONE

Desserts

"The mission of dessert is being that of a comforter of the stomach, which, being already appeased, nevertheless requires a little reflex flattery," says Elwanger in his *Pleasures of the Table*. This mission is perhaps more important in the menu of the convalescent than in any other.

FUNCTIONS OF DESSERTS

Desserts have several functions, however, in the patient's diet. Perhaps the first is the satisfaction that most people feel in having an attractive sweet at the end of a meal At the same time, it is often possible to supply nutrients particularly needed by a patient in a form to tempt appetite. When it is necessary to increase caloric content of a diet, desserts may be counted upon to furnish [illegible] using special protein concentrates When calories must be kept low or there is any reason for increasing the vitamin C content, fresh fruits, especially of the citrus type, are generally the best choice for dessert. Dessert recipes adapted for special therapeutic diets will be found in Chapter 50. For the preparation of fresh fruits *see* Chapter 39.

Desserts fall into several general categories, which, however, overlap in many cases For instance, simple combinations of milk and eggs are known as custards. When the same ingredients are thickened with gelatin, they fall into the classification of gelatin desserts When thickened with a cereal such as cornstarch or flour, or when combined with bread, they are usually known as puddings.

Frozen desserts are generally acceptable and are valuable because they are both refreshing and nourishing. As good-quality ice cream and ices are commonly available in manufactured form, they will seldom be prepared in the home. Recipes for a few frozen desserts which can be frozen satisfactorily in the automatic refrigerator are included in this chapter.

GENERAL RULES FOR SERVING DESSERTS

As a rule, desserts for the patient must be light and easy to digest. Fruits,

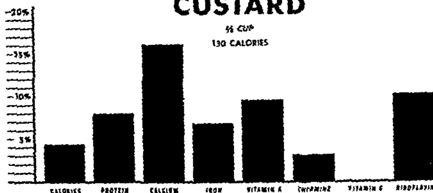


Figure 106

if desired. Cooking time will be slightly shorter in this case. Vanilla may be added for flavoring, if desired.

Caramel Custard

Procedure: Follow directions for baked custard. Before placing custard in cups, butter them liberally and put 1 tablespoon caramel syrup (see below) in the bottom of each cup.

Caramel Syrup

Procedure: Place ½ cup sugar in small frying pan, stir constantly over low heat until sugar melts and forms a syrup. Add another ½ cup sugar and continue stirring until dissolved. Add ½ cup boiling water very carefully and stir over low heat until syrup is smooth. Yield: Approximately ½ cup.

Bread Pudding

Procedure: Follow preceding directions for baked custard. Remove crust from 1 slice buttered bread, cut slice in half and put in the bottom of a small baking dish. Pour custard mixture over bread. Bake according to directions for baked custard. Serve hot or cold. Yield: 2 servings.

Cream Custard

Ingredients

- 1 egg white
- 1 tablespoon sugar
- Dash salt
- ½ cup thin cream
- Nutmeg

Procedure: Mix egg white, sugar and salt, add cream and stir until sugar is dissolved and egg white thoroughly mixed with cream. Pour into custard cups, sprinkle with nutmeg and make according to directions for baked custard. Yield: 2 small servings.

Soft Custard

Ingredients:

- 2 egg yolks, or 1 egg
- 2 tablespoons sugar
- Dash of salt
- 1 cup milk, whole or skim
- ½ teaspoon vanilla or almond

Procedure: Place egg yolks, sugar and salt in top of a small double boiler or saucepan and stir until blended. Add milk slowly and stir over hot water or over direct low heat until the custard when tested coats a metal spoon. Place utensil at once in cold water to cool quickly. Add flavoring and chill. Serve

Basic Recipe for Fruit Whip II

Ingredients:
- 1 egg white
- Dash salt
- ¼ cup sugar
- ¼ cup crushed fruit, fresh, canned or frozen
- 1 teaspoon lemon juice

[illegible]

Lemon Cream

Ingredients.
- 1 egg
- ¼ cup sugar
- Dash salt
- 1 tablespoon lemon juice
- ¼ teaspoon grated lemon rind
- 1 tablespoon boiling water

Procedure: Place egg yolk, sugar, salt, [illegible] move from heat, fold in stiffly beaten egg white Pour into bowl and chill in refrigerator. Just before serving stir and pile in sherbet glass Yield· 1 liberal serving.

Pineapple Cream

Ingredients·
- ⅓ cup boiled rice (p. 438)
- 2 tablespoons crushed pineapple
- ¼ cup cream

Procedure: Combine rice with crushed pineapple Whip cream and fold into rice mixture. Serve in sherbet glass. Yield. 1 liberal serving or 2 small servings.

Baked Rhubarb Pudding

Procedure: Line bottom and sides of small greased baking dish with buttered bread. [illegible] Dot [illegible] 75° [illegible] the rhubarb

Brown Betty

Ingredients·
- 2 slices bread
- 1 tablespoon butter
- 1 cup thinly sliced apples
- ¼ cup sugar
- ⅛ teaspoon cinnamon

Procedure: Trim crusts, dice bread and sauté in butter until browned. Arrange in alternate layers with apples, sugar and cinnamon in small greased baking dish. Cover and bake in moderate oven (375° F.) 20 minutes Remove cover and bake until brown. Serve hot with cream Yield 2 servings

Custards and Puddings

Custards, which are combinations of eggs and milk, sweetened and flavored, are natural carriers of protein To increase this content further, see High-Protein Recipes on page 555 For texture and flavor they must be baked in hot water or cooked over hot water in a double boiler. Directions must be followed exactly as to length of time to cook, as overcooking will cause some of the ingredients in baked custards to separate or whey.

Desserts usually known as puddings, of which tapioca cream, rice pudding, blanc mange and bread pudding are [illegible] gredients of a custard. Junket, in which milk is thickened by use of a rennet tablet, is sometimes known as a custard, although no eggs are used in its preparation

Baked Custard

Ingredients
- 1 cup milk
- 1 egg
- 1 tablespoon sugar
- Dash salt
- Nutmeg

Procedure. Scald milk Beat egg slightly, stir in sugar, salt and milk, continue stirring until sugar is dissolved. Strain and pour into custard cups Sprinkle with nutmeg and bake in a pan of hot water in moderate oven (375° F) about 30 minutes To test Insert knife into custard. When no custard adheres to knife, take from oven at once and place cups in cold water Yield 2 servings.

NOTE 2 eggs instead of 1 may be used,

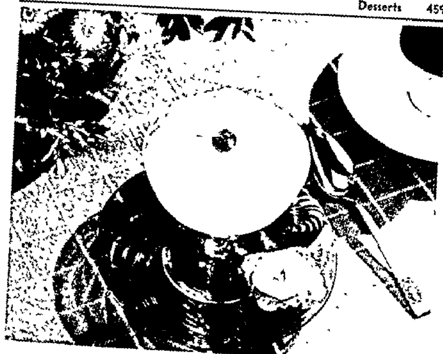


Fig 107 Fruit snow pudding ready to serve

purchase These come in a variety of flavors and call for the addition of milk or water and short cooking or a period of freezing time in the automatic refrigerator Many of them compare favorably with desserts prepared by a home recipe.

Gelatin Desserts

Gelatin desserts serve several purposes in the diet Clear jellies may serve as a medium for the use of extra fruit juice Jellied desserts made with eggs and milk will be a medium for increasing protein For a low caloric dessert, Sucaryl or saccharin may be used.

General Directions for Gelatin Desserts

Unflavored gelatin should be softened in cold water, then dissolved in hot liquid or over hot water The contents of 1 envelope of unflavored gelatin equal 1 tablespoon Flavored gelatin should be prepared according to directions on package It should be noted that fresh pineapple cannot be used in gelatin mixtures, although canned pineapple juice and fruit can be used successfully Gelatin desserts are usually poured into molds and cooled somewhat before being placed in the refrigerator The jelly will set completely in small molds in about 2 hours It is not necessary to rinse the molds with water

To unmold gelatin set mold in lukewarm water ½ minute Loosen edge of dessert with sharp knife Wipe bottom of mold, place serving plate over mold and invert, shaking gently If dessert does not loosen, return to lukewarm water for ½ minute

When a jellied mixture is used as a base for fruit jellies and desserts made with milk and eggs, it should be chilled

with whipped cream or pour over sliced oranges, berries, stewed pears, boiled rice or sponge cake Yield: Approximately 1½ cups custard

Custard Rice Pudding

Procedure: Follow directions for soft custard, increasing amount of sugar to ½ cup Have ready ½ cup boiled or steamed rice and fold into hot custard mixture Pile into sherbet glasses and sprinkle with grated nutmeg or grated orange rind and chill. Yield 2 servings

NOTE ¼ cup seedless raisins or drained crushed pineapple may be folded into the rice before being added to the custard.

Fluffy Custard

Ingredients:
- 1 cup milk
- ¼ cup sugar
- 1 tablespoon flour
- Dash of salt
- 2 egg yolks, slightly beaten
- 2 tablespoons brandy, rum or sherry
- *2 egg whites, stiffly beaten*

Procedure: Scald ¾ cup milk in top of double boiler Mix sugar, flour and salt, stir into beaten egg yolks. Stir in cold milk to make a smooth paste and stir into scalded milk. Continue stirring over hot water until

berries or sliced fruit. Yield Approximately 1½ cups custard.

Tapioca Cream

Ingredients:
- 1 tablespoon quick-cooking tapioca
- Dash salt
- 1½ tablespoons sugar
- 1 egg
- 1 cup milk
- ½ teaspoon vanilla

into stiffly beaten egg white Pour into bowl or sherbet glasses and chill Yield 3 servings

Golden Tapioca

Procedure: Follow preceding directions for tapioca cream, substituting 2 tablespoons brown sugar for 1½ tablespoons sugar.

Cornstarch Pudding

Ingredients:
- 1 cup milk
- 1½ tablespoons cornstarch
- 1 egg yolk, slightly beaten
- 2½ tablespoons sugar
- Dash of salt
- ½ teaspoon vanilla extract
- 1 egg white, stiffly beaten

Procedure: Scald ¾ cup milk in top of double boiler. Stir remaining milk into cornstarch to make a smooth paste. Stir into the scalded milk and continue stirring until slightly thickened Cover and cook over hot water 10 minutes. Combine slightly

cream, custard sauce (see Soft Custard, p 457, Chocolate Sauce, p. 463) or crushed sweetened fruit. Yield· 3 servings

For chocolate cornstarch pudding, add ½ square shaved chocolate to milk before scalding and allow to melt.

Other variations may be made by adding 2 tablespoons shredded coconut or 3 to 4 crumbled macaroons to the mixture before adding beaten egg white.

Junket

Ingredients:
- ½ junket tablet
- ½ tablespoon cold water
- 1 cup milk
- *1 tablespoon sugar*
- ¼ teaspoon vanilla

Procedure: Crush junket tablet and dissolve in cold water. Heat milk until lukewarm Add sugar and vanilla, stir until dissolved Stir in dissolved junket and pour

in package form Yield 2 servings

Prepared Puddings

Many prepared mixes for puddings and frozen desserts are now available for



Fig 308 Ice cream may be attractively served in a glass dish

Beat egg with sugar and salt, stir the hot mixture into this Place in small double boiler and stir over hot water until mixture thickens slightly Add vanilla extract and chill until mixture begins to set. Fold in stiffly beaten egg white and pour into bowl or sherbet glasses Serve with whipped cream or sweetened crushed fruit. Yield 3 servings

Bavarian Cream

Procedure: Follow preceding directions for Spanish cream, substituting ½ cup whipped cream for the stiffly beaten egg white

Caramel Spanish Cream

Procedure: Follow directions for Spanish cream, substituting ½ cup brown sugar, firmly packed, for 2 tablespoons sugar The

in the refrigerator until it begins to set; that is, when the consistency is somewhat like that of a thick syrup or an unbeaten egg white. After the remaining ingredients are added, the mixture is poured into a mold and placed in the refrigerator until firm.

Lemon Jelly

Ingredients:
- ½ tablespoon unflavored gelatin
- 2 tablespoons cold water
- ½ cup boiling water
- 3 tablespoons sugar
- ½ cup cold water
- ½ cup lemon juice

Procedure: Soften gelatin in cold water, add boiling water and stir until dissolved. Add sugar, stir until dissolved, add cold water and lemon juice Strain and pour into molds Chill in refrigerator until set and unmold according to general directions Yield. 2 servings.

Snow Pudding

Procedure: Follow directions for lemon [illegible] sauce (*see* Soft Custard, p. 457)

Fruit Snow Pudding

Procedure. Fill sherbet glasses one third full of snow pudding mixture. Arrange sections of peeled ripe pears or peaches on this and top with more of the pudding mixture.

Orange Jelly

Procedure· Follow preceding directions for lemon jelly, substituting ½ cup orange juice for 3 tablespoons lemon juice

Orange Charlotte

Procedure: Follow directions for orange [illegible] replace the whipped cream.

Jellied Fruit

Procedure: Follow directions for lemon jelly (above), reducing lemon juice to 2 tablespoons. Chill until jelly begins to set. Fold in ½ cup sliced fruit such as peaches, bananas, strawberries, raspberries, cut orange or grapefruit sections, stewed or canned apricots, prunes, canned peaches or pineapple. Not more than 3 fruits are usually combined

Coffee Jelly

Ingredients:
- 2 teaspoons unflavored gelatin
- 2 tablespoons cold water
- 1 cup strong hot coffee
- ½ cup sugar
- Dash salt

Procedure: Soften gelatin in cold water, add hot, freshly made coffee, sugar and salt, stir until dissolved. Pour into molds, chill until set Unmold. Garnish with whipped cream Yield. 2 servings.

Coffee Charlotte

Procedure: Follow directions for coffee jelly and finish preparation according to directions for Orange Charlotte

Wine Jelly

Ingredients:
- ½ tablespoon unflavored gelatin
- 2 tablespoons cold water
- ½ cup boiling water
- 3 tablespoons sugar
- ½ cup orange juice
- 1 tablespoon lemon juice
- ½ cup sherry wine

Procedure: Soften gelatin in cold water, add boiling water and stir until dissolved Add sugar, fruit juices and wine. Strain and pour into molds. Chill until set. Unmold and garnish with whipped cream. Yield 2 servings.

Spanish Cream

Ingredients:
- 1 cup milk
- ½ tablespoon unflavored gelatin
- 2 tablespoons cold water
- 1 egg
- 2 tablespoons sugar
- Dash salt
- ½ teaspoon vanilla extract

Procedure. Scald milk. Soften gelatin in cold water and dissolve with scalded milk.

Procedure Combine ingredients in sauce pan and mix thoroughly. Stir over very low heat until thick and smooth Serve hot or cold Beat well before serving Yield 3 servings

Chocolate Sauce

Ingredients·
- X square chocolate
- X cup water
- X cup sugar
- Dash salt
- X teaspoon vanilla extract
- 1 teaspoon butter

Procedure [illegible] add vanilla extract and butter Serve hot over ice cream, sponge cake or angel food. A ball of ice cream may be served with the cake Yield 3 servings

Quick Chocolate Sauce

Procedure: Cut in small pieces half of a X-lb bar milk chocolate into a small saucepan and stir over hot water until chocolate is melted

STUDY QUESTIONS

1 Desserts can play an important place in the diet For what reasons?

2 A dessert should be light and easy to digest Which classes of dessert will fill these requirements?

3 Fruit desserts should be appetizing and easy to digest Discuss these factors

4 Gelatin may be used advantageously in the preparation of desserts. With which other foods is it often combined? What are the basic rules for the preparation of a gelatin dessert?

5 Custards are excellent desserts Explain this statement.

6 Ice cream is the standard dessert in the diet for a convalescent. For what reasons?

See Bibliography in Part Four for books on Cookery.

unmolded dessert may be garnished with whipped cream and toasted almonds, if desired. Undiluted evaporated milk may be substituted for the milk.

Mocha Spanish Cream

Procedure: Follow directions for Spanish cream. Add 1 teaspoon instant coffee to hot [illegible] milk.

Molasses Mousse

Ingredients:
- 2 teaspoons unflavored gelatin
- 2 tablespoons cold water
- ¾ cup (7 oz. can) undiluted evaporated milk
- ¼ cup molasses
- 1 teaspoon grated orange rind
- 2 teaspoons orange juice

Procedure: Soften gelatin in cold water. Scald half the milk, add to gelatin and stir [illegible] Yield [illegible] servings.

Frozen Desserts

Frozen desserts play an important part in the diet. Almost everyone likes [illegible] than that of sherbet.

Ice Cream. If ice cream is not to be [illegible] soften slightly at room temperature.

Ice cream may be piled in a chilled sherbet glass or on a chilled plate. Vanilla ice cream may be varied by garnishing with sweet crushed fruit, such as strawberries, raspberries or peaches, or by using a chocolate sauce (p. 463) or a butterscotch sauce (this page).

Refrigerator Desserts. Special recipes are necessary for desserts which are to be frozen in an automatic refrigerator. Except in a "freezer" or in a special low-temperature compartment, these desserts cannot be prepared satisfactorily in very small quantities. Mixes especially designed for frozen dishes can be purchased or the following recipes may be used instead.

Vanilla Ice Cream
(Automatic Refrigerator)

Ingredients:
- ⅔ cup (7½ oz. can) sweetened condensed milk
- ½ cup water
- 1½ teaspoons vanilla
- 1 cup heavy cream

Procedure: Mix sweetened condensed milk, water and vanilla. Chill. Whip cream to custardlike consistency. Fold into chilled mixture. Place in freezing unit or special compartment of refrigerator until half frozen. Scrape mixture into bowl. Beat until smooth but not melted. Replace in freezing unit until frozen. (Total time of freezing from 2 to 4 hours.) Yield: 1½ pints.

Chocolate Ice Cream

[illegible] directions for [illegible] other ingredients.

Coffee Ice Cream

Procedure: Follow directions for vanilla ice cream (above), substituting strong coffee for water. Decrease vanilla to ½ teaspoon.

Orange Ice Cream

Procedure: Follow preceding directions for vanilla ice cream (above), substituting orange juice for water and ½ teaspoon grated orange rind for the vanilla.

Sauces

Butterscotch Sauce

Ingredients:
- 1 egg yolk
- ½ cup brown sugar, firmly packed
- 1 tablespoon water
- 1 tablespoon butter



Fig 109. Tray with an assortment of cheeses and crackers, and a fruit bowl

finished product Then it is sold as "creamed" cottage cheese Considerable of the calcium is lost in the process of manufacture, and it is not a good source of this mineral Most of the vitamin A is also removed in the manufacture of butter and cream, of which cottage cheese is an important by- [illegible] d the [illegible] e [illegible], [illegible] n [illegible] of cream added, which gives it a higher caloric value.

Luxury Cheeses. Other varieties of cheese, sometimes known as luxury or epicurean cheeses, are used more as an accessory to a meal than as a staple part of it. They account for not more than one eighth of the cheese production in the United States With the exception of Liederkranz, which originated in this country, *domestic* products are called by the names of the foreign types of cheese which they closely resemble The label bears the name of the country in which the cheese is manufactured.

All types of cheese can be counted upon to furnish flavor to a meal, whether the cheese is used as an ingredient of a dish or as an accompaniment

FOOD VALUE

As has been stated in a previous chapter, milk is the best single food provided by nature Lost in the process of the manufacture of cheese are a small amount of the protein content, a portion of the milk sugar, certain mineral salts and some of the water-soluble vitamins.

Types of Cheese
Food Value
Digestibility
Use of Cheese in the Menu
Principles of Cookery
Recipes

CHAPTER FORTY-TWO

Cheese

The general term *cheese* is applied to any product made from the concentrated curd of milk. Cheese is considered to be the first manufactured food, the process for which was probably discovered accidentally when milk was stored in a bag made from the stomach of a cow, which contains rennin. The action of rennin upon milk causes the curds and the whey to separate. While a certain amount of the milk nutrients remains in the whey, the majority remains in the curd, which provides a large amount of the natural food value in milk in concentrated form

Both food value and flavor of the many types of cheese which are available today depend upon the percentage composition and the methods of ripening which are used in production The ancient rennet method is still used in modern cheese manufacture for some types of cheese, while for others the curd and the whey are separated by means of lactic acid through adding pure cultures of bacteria to the milk. While a very small amount of cheese is made in Europe from the milk of sheep and goats, cow's milk is the basis for the great majority of both domestic and foreign types of cheese.

TYPES OF CHEESE

Until comparatively recent times, and due perhaps to the abundance of meat in the United States, cheese was used more as an accessory than as a staple food.

Cheddar cheese was formerly known as "store" cheese, as it was the first commercial type, although there was always home production of cottage cheese. Now, however, the manufacture of cheese and cheese spreads has become a large commercial industry. Much of the cheese of the Cheddar type used in the United States today is processed and packaged. The processing, which includes pasteurization, produces a standard product. However, it lacks the pungent and the individual flavor of a fine Cheddar cheese prepared and allowed to ripen naturally. A great variety of spreads prepared from a cheese base, and some of them seasoned or flavored with other savory ingredients, is now available.

Cottage cheese, made from pasteurized skim milk, is next in order of consumption to Cheddar cheese. Because of the absence of cream, the caloric value is much lower than that of Cheddar unless extra cream is added to the



Fig 109. Tray with an assortment of cheeses and crackers, and a fruit bowl.

finished product. Then it is sold as "creamed" cottage cheese Considerable of the calcium is lost in the process of manufacture, and it is not a good source of this mineral. Most of the vitamin A is also removed in the manufacture of butter and cream, of which cottage cheese is an important by-product, both from the nutrition and the economic standpoint

Cream cheese, which, like cottage cheese, is not ripened and is, therefore, also a perishable product, is made from whole milk with a certain amount of cream added, which gives it a higher caloric value

Luxury Cheeses. Other varieties of cheese, sometimes known as luxury or epicurean cheeses, are used more as an accessory to a meal than as a staple part of it. They account for not more than

products are called by the names of the foreign types of cheese which they closely resemble The label bears the name of the country in which the

FOOD VALUE

As has been stated in a previous chapter, milk is the best single food provided by nature Lost in the process of the manufacture of cheese are a small amount of the *protein* content, a portion of the milk sugar, certain mineral salts and some of the water-soluble vitamins.



Fig 110 Toasted cheese sandwich with rabbit sauce

However, the retention of the large amount of protein and fat, calcium, phosphorus, riboflavin and vitamin A, except in cottage cheese, makes cheese a valuable food The distinctive flavor characteristic of ripened cheese and its high protein content make it an unusually acceptable meat alternate

DIGESTIBILITY

In general, cheese is easily digested However, the high fat content and the strong flavor of ripened cheese make it unsuitable in some conditions for use on the patient's tray Cottage and cream cheeses, because of their lower degree of concentration and milder flavor, can generally be used early in convalescence Later, Cheddar cheese may be used in combination with other foods as an ingredient for a main dish or as a filling for a sandwich One of the finer types of cheese accompanied by crackers may serve as a dessert The serving of crackers or bread with cheese is good nutritional practice The favorite American dessert of pie with cheese is more appropriate after a light meal than a heavy one.

USE OF CHEESE IN THE MENU

Until the beginning of the century, little use was made by Americans of cheese as an ingredient or as the basis of the main dish for a meal American Cheddar, sliced for use as a sandwich filling and cut in wedges for serving with pie, and cottage cheese as an accessory to the main course appeared occasionally on the table. Grated cheese had some use as a flavoring for sauces, for macaroni and other foods, and as a topping for creamed dishes In some households it was used occasionally as a "rabbit."

The increased availability of variations of the Cheddar type of cheese, sold by the package, by the pound or in spread form, each with its own distinctive name and flavor, has stimulated the use of cheese on the table. Cottage and



Fig 111 Cheese soufflé

cream cheese ...

because most of them have such distinctive flavor, the fine "luxury" types of cheese are reserved as a general rule for serving after meals, although occasionally they appear with salad For a special salad dressing, Roquefort or blue cheese is a favorite ingredient.

PRINCIPLES OF COOKERY

When cheese ...

to use a double boiler and to cook the cheese over hot water For baked cheese dishes, a low temperature is generally used, and sometimes directions call for placing the dish containing the cheese mixture in a pan of hot water

When a high temperature is used, as ...

cooked by any method.

RECIPES

Cheese Soufflé

Ingredients·
- 2 tablespoons butter or margarine
- 2 tablespoons flour
- ¼ teaspoon salt
- ½ cup milk
- ¼ pound (1 cup) Cheddar cheese, flaked
- 2 egg yolks
- 2 egg whites, stiffly beaten

Procedure Melt butter or margarine in a

beating after each addition. Fold into the stiffly beaten egg whites Pour into greased 1-pint casserole and bake in slow oven *(300° F) 1 hour or in moderately hot* oven (425° F.) 25 minutes Yield: 2 generous servings

Cheese Fondue

Ingredients:
- ½ cup milk
- ½ cup soft bread crumbs
- ¼ teaspoon salt
- ½ cup grated Cheddar cheese
- 1 egg yolk, unbeaten
- 1 egg white, stiffly beaten

Procedure: Combine milk, bread crumbs and salt Cook over low heat, stirring with a fork until mixture is smooth and bubbling. [illegible] greased 1-pint baking dish in moderate oven (350° F.) until golden brown (about 25 minutes). Yield 2 servings.

Toasted Cheese

Ingredients
- ½ cup grated Cheddar cheese
- ¼ teaspoon salt
- ⅛ teaspoon paprika
- 1 egg
- ½ cup milk

Procedure. Grease thoroughly a small pie pan or 4-inch au gratin dish Grate cheese [illegible] ing.

NOTE. ⅛ teaspoon mustard may be added

Welsh Rabbit

Ingredients:
- 1 egg
- ¼ teaspoon salt
- ⅛ teaspoon paprika
- 2 tablespoons milk
- ½ cup grated Cheddar cheese

Procedure: Break egg into top of small double boiler or small saucepan Beat until foamy, stir in other ingredients and cook over hot water, stirring constantly until smooth and thick Pour over toast and serve at once. Yield. 1 serving

Tomato Rabbit

Ingredients:
- ½ cup grated Cheddar cheese
- ½ cup condensed tomato soup

Procedure: Combine cheese and tomato soup in top of small double boiler or small saucepan. Stir over hot water until mixture is smooth and thick. Pour over toast and serve at once. Yield. 1 serving

NOTE This recipe may be used as a sauce for toasted cheese sandwich.

For other recipes using cheese, *see* Chapter 38 (Cereals, Macaroni, Noodle and Rice Recipes) and Chapter 48 (Breads, Toast and Sandwich Recipes).

STUDY QUESTIONS

1. List the types of cheese most commonly used. List the types of cheese which you have eaten.
2. Compare the food value of milk with cheese.
3. Give the reasons why cheese is considered to be a good substitute for meat.
4. Which cheese is low in fat? Suggest recipes for its use.
5. Consult Table I, Part Four, and list comparative contributions of milk, cheese and meat in regard to mineral content.
6. Discuss the digestibility of cheese. Why is it better to use cheese with bread or crackers?
7. *Outline the principles of cheese* cookery.

See Bibliography in Part Four for books on Cookery.

CHAPTER FORTY-THREE

Meats and Poultry

The term *meat* is used to cover poultry as well as the flesh of larger animals Beef, lamb, mutton and pork are most commonly used Meat is so generally liked that those who can afford it use it daily, with the possible exception of Friday The preference for the flavor of meat, as well as its value as a food, makes it an important factor in the menu of most American families

TRENDS IN MEAT CONSUMPTION

The consumption of meat has been comparatively heavy in the United States, although far less so than in pioneering days Finding meat abundant and cheap, the settlers of the new lands made it a large part of their diet, to which it added savor as well as bulk There was then a smaller variety of other foods available than at present The rising costs of meats and the increased variety of other foods available in the markets have changed the emphasis on meat as a preponderant part of the diet The reaction to the custom of eating meat at every meal lowered the consumption markedly and resulted in its being considered by some a luxury rather than a necessity However, the experimental work of the past years has shown that it is difficult to obtain an adequate amount of protein of high quality without the use of a substantial amount of meat in the daily diet As shown in Figure 112, there is no significant difference in the protein content of various types of meat.

SAFE MEAT

Meat is a protein food, therefore, special precautions must be used in slaughtering, storing and shipping Because meat is often transported long distances, the Federal Government can enforce rigid inspection of the large

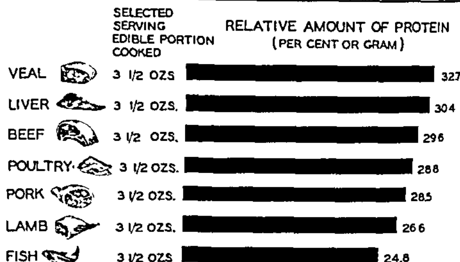


Fig 112. Relative amounts of protein in 3½-oz. serving (cooked). (National Live Stock and Meat Board, Chicago.) Meat data, with exception of liver, based on research by R. M. Leverton, Ph.D. (1958)

meat companies which conduct interstate business Local authorities should

meat to hang long enough to become tender. Tenderness depends upon this period of hanging, as well as upon the age of the cattle and upon the way in which they were fed. The importance of the careful handling and refrigeration of meat cannot be overestimated, for very high bacterial counts have been reported

For special precautions with regard to ensuring the safety of pork through long cooking see page 475

Frozen meats, for which various cuts are trimmed and made ready for cooking, are now available in packaged form. Although they may be cooked while still frozen, it is generally preferable to allow them to thaw slowly on the shelf of the refrigerator or quickly at room temperature. If not to be used the day of purchase, frozen meat should be stored in freezing compartment of the refrigerator.

Meat in general should be stored loosely covered with paper in the refrigerator as soon as it comes from market. Ground meat and organs such as liver and kidneys, which are highly

TYPES OF MEAT

Beef

Beef, coming as it does from such a large animal, varies greatly *in its texture*, and this means that special care

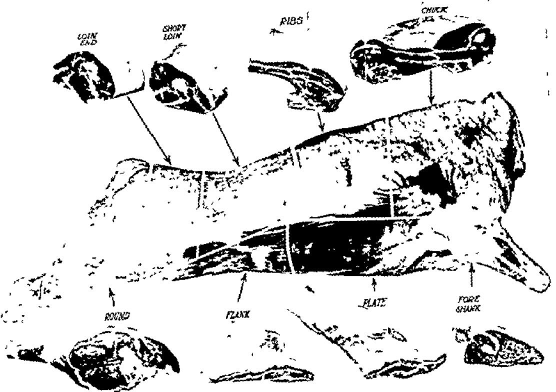


Fig 113 The various cuts of beef (Public Relations Department, Swift & Company, Chicago)
(Continued on page 472)

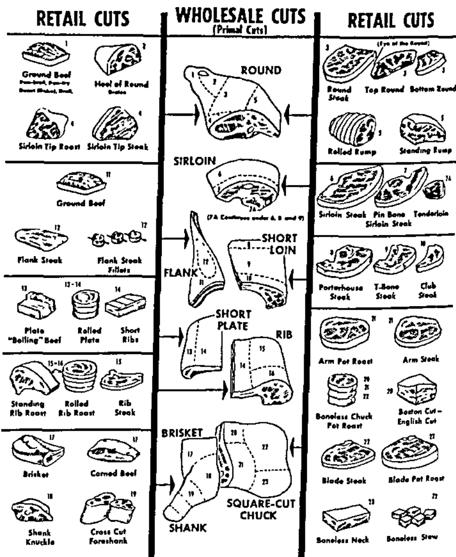


Fig 113 (Continued) Meat packers sell most of their beef in the form of quarters—forequarters and hindquarters To meet the specific needs of retailers, hotels and others, beef is also sold as Wholesale Cuts.

quarter are better pot-roasted or stewed Bony portions such as the shin and the shoulder are used for soups.

When beef is used for the patient, a small club steak, a "minute" steak, thinly sliced from the round, or a piece of the tenderloin, or fillet which can be broiled quickly is usually chosen

Beef, unlike other meats, when either broiled or roasted is generally preferred rare or medium.

Veal

Veal is the meat of a young calf not less than 3 weeks old at the time of slaughter The best veal comes from milk-fed calves from 6 to 8 weeks old. Veal cuts may be used as soon as dressed, as they are not improved by hanging

Formerly, veal was considered more indigestible than beef, but experiments have shown that young veal is digested as easily as mature beef Veal is lacking in flavor and fat, and for this reason fat may be added in the process of cooking More seasoning should be added than for other meats It should be cooked thoroughly to soften the large amount of connective tissue which it contains

Lamb and Mutton

Lamb is the meat of the young sheep Mutton is the meat of the mature animal The dividing line between lamb and mutton is not based entirely on age The meat from a well-bred and well-fed animal of 1 year or a year and a half may still be considered lamb, while the meat from a poorly fed animal of 1 year may be considered mutton Lamb will be tender without a period of hanging, while mutton, like beef, should be hung to ripen

For invalids, lamb chops, either loin or rib, are used more often than the other cuts, although a slice of meat from a well-done roast may be served Chops should always be broiled, not fried.

Pork

Pork is the meat of the pig or hog and is used extensively throughout the world. A large amount of fat is embedded in the tissues of the hog, and pork contains more fat than any other meat. Therefore, it is more slowly digested. Fresh pork should have firm, pinkish white flesh, with firm, clear, white fat.

Variety Meats

The organs and the glands of animals are known as variety meat or sundries Among these, tongue has long been a staple Next to this, the most commonly used has been the liver The discovery that this organ was so high in food value, especially in its contribution of iron and certain vitamins, caused a large demand for it The price of delicate calf's liver doubled and tripled This caused increased use of beef liver. Lamb and pig liver, which have always been used to some extent, are now more in demand Next in popularity to liver are veal and lamb kidneys, but beef kidney, which is generally less expensive, is also used Sweetbreads have always been considered a delicacy. Their source is the thymus gland of the calf and the lamb Lamb sweetbreads are so small that they are seldom seen in market The pancreas, which is sometimes known as the stomach sweetbread, is occasionally available

Other portions which belong in this classification of variety meats are heart from the calf or beef, tripe which is obtained from the fatty interlining of the stomach of the beef or calf, and brains which are somewhat like sweetbreads in texture and in flavor

TYPES OF POULTRY

Chickens, geese, ducks and turkeys are the common domestic birds used as food, although chickens are the most plentiful among fowls. Capons (male birds castrated at an early age) are highly prized for their fine flavor and

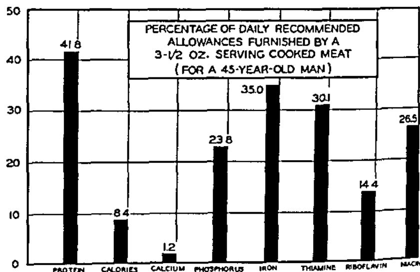


Fig. 114. Per capita meat consumption in 1957, based on research by R. M. Leverton, Ph.D. (National Live Stock and Meat Board, Chicago)

large proportion of light meat. Guinea hen, squab, partridges and other game are luxuries used when obtainable. Because of modern methods of incubation, chickens may be hatched and marketed at any time of the year, so that broilers and fryers are no longer limited to the spring output. In many places it is now possible to buy various parts of chicken, and this is particularly convenient in cooking for the convalescent.

The quality of poultry has been standardized to a great extent by modern methods of breeding, care and feeding. Modern methods produce birds with a higher proportion of meat, and tenderness is ensured through prevention of exercise. The birds come to market in [illegible] frozen form. With

that of the best fresh-killed bird. However, it should be kept frozen at the market. As poultry is as perishable as meat in general, it should be given the same care after it reaches the home kitchen.

Chickens, the most largely used type of poultry, are known by various terms which indicate size and, to some extent, tenderness. This is shown in the accompanying chart.

Squab	¾-1½ lbs.
Broiler	1½-2½ lbs.
Fryer	2½-3½ lbs.
Roaster	3 lbs. or over
Fowl	4 lbs. or over

The quality of poultry depends upon the texture and the flavor of the flesh, as well as upon the distribution of flesh and fat on the carcass. Exercise affects the flavor and the texture of the meat, and the extractives are increased. A chicken that has been allowed to run will develop tough leg muscles and have a lessened amount of tender or white meat. The age of a chicken determines its flavor to a large extent—at first, advantageously, and afterward, disadvantageously.

FOOD VALUE

The largest contribution of meat to the diet lies in the fact that it provides protein of high quality that can be *readily digested and utilized* At the same time, meat furnishes an appreciable amount of phosphorus and iron These constituents vary in amount in ratio to the fat and the lean content, as they are found only in lean tissue As meat is always eaten in cooked form, the nutritive value table is based on this fact A recent and valuable contribution has been made by Leverton and Odell,[1] of Oklahoma State University. The report shows that the nutritive values of meat by modern methods of butchering and trimming are higher in protein and lower in fat

So far as vitamin content is concerned, meats in general are good sources of the B complex, especially thiamine and niacin The internal organs, such as liver and kidney, are richer in vitamins than the muscle tissue Lean pork is much higher in thiamine than are other meats Liver is an exceedingly good source of vitamin A, and it also contributes some vitamin C and B complex

The preference for meat is so great that it is difficult to plan satisfying and adequate meals without its use.

DIGESTIBILITY

The high coefficient of digestibility, from 97 to 98 per cent, is an asset which *meat shares with milk and eggs* It is digested not only completely but rapidly Since it pleases the palate and because it is easily digested, chicken is used in the diet of the patient more often than other meats White meat is slightly more easily digested than dark, because the fibers are held together less firmly and there is less fat in white meat. There is no support for the opinion that dark meat produces more uric acid than white

[1] Leverton, R M, and Odell, G. V., The Nutritive Value of Cooked Meat, Miscellaneous Publ M P -49, Oklahoma State University, March, 1958

MEAT AND POULTRY IN THE MENU

Under the general term *meat*, poultry is included with beef, veal, lamb and pork Some form of meat should be served at least once a day unless there is some specific reason for its exclusion from the diet

GENERAL PRINCIPLES OF COOKERY

Meat. In cooking meat, two principles should be observed in the interest of flavor and texture Tender cuts, if the flavor is to be preserved, should be cooked without water, which its texture *does not demand Broiling and roasting* are the accepted methods for these cuts A constant low temperature of approximately 300 to 325° F is now generally recommended for roasting in order to prevent shrinkage and to produce consistent results This is particularly important in cooking large quantities When a high temperature is used at first, it should be lowered to 350° F after the meat is browned Uncovered pans *should be used for roasting* For less tender cuts, the use of some liquid is necessary Pot roasts are often seared by browning in hot fat before the liquid is added, and cooking is continued in a covered utensil For soups, where the aim is to draw the flavor into the liquid, part of the meat may be seared for flavor and the remainder put directly into cold water and simmered for a long time, the pot being covered for the first portion of the cooking

Pork Fresh pork should be cooked until every vestige of pink coloring in *the flesh has disappeared Particular* care should be taken to follow directions for cooking which come with the tenderized smoked hams now so generally distributed. The meat itself becomes tender enough to eat before the cooking process has been sufficient to kill trichina spiralis which may be present Unlike any other

MEAT COOKERY GUIDE

COOKING METHODS	BEEF CUTS	VEAL CUTS	PORK CUTS	LAMB CUTS	VARIETY MEATS
ROASTING	Standing Rib Rolled Rib Sirloin Chuck Ribs (high quality) Rump (high quality) Loaf	Rolled Shoulder Cushion Shoulder Arm Roast Blade Roast Rib Loin Rump Leg	Loin Rolled Shoulder Cushion Shoulder Fresh Ham (pork leg) Smoked Picnic Smoked Shoulder Butt Smoked Ham Sausages Sliced Salt Pork	Cushion Shoulder Rolled Shoulder Breast with Pocket Rolled Breast Rack Leg	Liver (beef-veal-pork-lamb)
BROILING and PAN BROILING	Rib Steaks Club Steaks T-Bone Steaks Porterhouse Steaks Sirloin Steaks Chuck Steaks (high quality) Rump Steaks (high quality) Patties	Veal is not broiled or pan-broiled	Fresh pork is not broiled or pan-broiled Smoked Ham Slices Sliced Bacon Sliced Canadian-style Bacon Smoked Shoulder Butt Slices	Rib Chops Loin Chops Shoulder (arm or blade) Leg Steaks Patties Choplets (from breast stuffed with ground lamb)	Liver (veal-lamb) Kidney (lamb) Sweetbreads (beef-veal-lamb)

FRYING	Thin Steaks (tender or pounded) Patties	Chops Cutlets Steaks Patties	Sausage Sliced Salt Pork	Thin Chops or Thin Steaks	Liver (all kinds if cut thin) Tripe (after pre-cooking in water) Sweetbreads Brains
BRAISING	Chuck (arm or blade) Rump Round Heel of Round Brisket Plate Short Ribs Flank Shanks Ox-joints	Breast Rib Chops Loin Chops Shoulder Chops Cutlets Patties	Rib Chops Loin Chops Shoulder Chops or Steaks Fresh Ham Slices	Breast Neck Slices Shanks Riblets Shoulder (arm or blade)	Liver (beef pork) Kidney (beef veal-pork) Heart (beef-veal-pork-lamb) Tripe (beef) Sweetbreads (beef-veal-lamb)
COOKING IN LIQUID (Stews and Large Cuts)	Neck Shank Plate Brisket Flank Heel of Round Ox-joints Corned Beef	Neck Shoulder Shanks Flank	Hocks Shanks Feet Backbones Neck Bones Spareribs Smoked Picnic Smoked Shoulder Butt Smoked Ham Shanks Smoked Spareribs Smoked Hocks	Neck Steaks Shoulder Breast	Kidney (beef-veal pork lamb) Heart (beef-veal-pork lamb) Tongue (beef-veal pork lamb) Tripe (beef) Sweetbreads (for precooking) Brains (for pre-cooking)

MEAT COOKERY GUIDE

COOKING METHODS	BEEF CUTS	VEAL CUTS	PORK CUTS	LAMB CUTS	VARIETY MEATS
ROASTING	Standing Rib Rolled Rib Sirloin Chuck Ribs (high quality) Rump (high quality) Loaf	Rolled Shoulder Cushion Shoulder Arm Roast Blade Roast Rib Loin Rump Leg	Loin Rolled Shoulder Cushion Shoulder Fresh Ham (pork leg) Smoked Picnic Smoked Shoulder Butt Smoked Ham Sausages Sliced Salt Pork	Cushion Shoulder Rolled Shoulder Breast with Pocket Rolled Breast Rack Leg	Liver (beef-veal-pork-lamb)
BROILING and PAN BROILING	Rib Steaks Club Steaks T Bone Steaks Porterhouse Steaks Sirloin Steaks Chuck Steaks (high quality) Rump Steaks (high quality) Patties	Veal is not broiled or pan-broiled	Fresh pork is not broiled or pan-broiled Smoked Ham Slices Sliced Bacon Sliced Canadian-style Bacon Smoked Shoulder Butt Slices	Rib Chops Loin Chops Shoulder (arm or blade) Leg Steaks Patties Choplets (from breast stuffed with ground lamb)	Liver (veal-lamb) Kidney (lamb) Sweetbreads (beef-veal-lamb)



Fig. 117 Broiled lamb loin chop served with vegetables

by cooking in water and contribute flavor to the stock in ratio to its concentration. The small amount of protein is in the form of gelatin. Soups made with meat stock are appetizing rather than nourishing.

CARE OF MEAT

All fresh and cooked meat must be stored in the refrigerator. Fresh meat and poultry should be lightly but not tightly covered with waxed paper. Chopped meat and glandular meats should be used the day they are purchased or stored in the freezing compartment of the refrigerator. Leftover cooked meat should be covered before being stored on the shelf of the refrigerator and should be put to use within a reasonable time before there is the slightest change in flavor.

Quick frozen meats, of which chicken is the most commonly used, will defrost in from 3 to 4 hours at room temperature. If they are not to be used on the day of purchase, they should be stored in the freezing compartment of the refrigerator. No attempt should be made to refreeze after thawing. If only a portion of a carton is required, that portion should be cut off and allowed to thaw, and the remainder should be placed at once in the freezing compartment.

MEAT RECIPES

Broiled Steak

Procedure: If only 1 portion of steak is to be prepared, a cut from the tenderloin is generally used. Allow from ½ to ⅜ lb. for each serving. Small club steaks are delicious when broiled, but they will weigh at least 1 lb. Steaks are usually cut at least 1½ inches thick, although very thin steak known as

food animal, a pig or a hog is susceptible to trichinosis, which may be passed on to humans if measures to kill any parasites present are omitted. As the presence of these is not apparent, there is no way of judging whether or not pork contains them until some time after it has been eaten and symptoms of trichinosis appear. Under the present methods of production and slaughtering, the only insurance is thorough cooking in the home kitchen.

EFFECT OF COOKING ON FOOD VALUE

As practically all meat is eaten in cooked form, research has been concerned with the loss of natural vitamin content in cooking. Experiments have shown that some of the vitamins in various cuts of meat are affected differently by the same methods of cooking. Frying, for instance, does not reduce the thiamine content, but it has some effect upon riboflavin and more on niacin. On the other hand, braising and stewing reduce thiamine to a greater extent than they do riboflavin and niacin. Results from roasting and broiling are about the same with regard to all three of the vitamins. (*See* Fig 116.)

Soups prepared from meat and bones have very little food value. The extractives, which are soluble, are drawn out

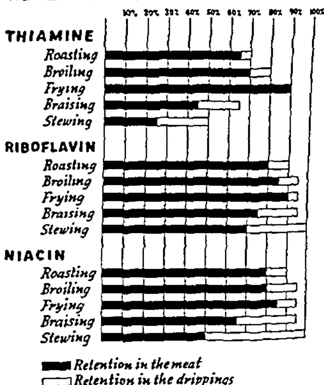


Figure 116

(National Livestock and Meat Board, Chicago)

Preheat oven to 325° F. Roast at this moderately slow temperature. For any rolled boned roast increase time allowance 10 minutes per lb. according to directions for each type of roast

Roast Beef

Procedure: For rare roast beef, allow from 21 to 25 minutes per lb., or until meat thermometer reads 140° F. For medium roast beef, allow from 27 to 35 minutes per lb., or until thermometer reads 160° F For well-done roast beef, allow from 33 to 40 minutes per lb., or until thermometer reads 170° F.

Roast Lamb

Procedure: For medium roast lamb, allow [illegible]

Roast Fresh Pork

Procedure: Allow 45 minutes per lb., or until meat thermometer reads 185° F.

Roast Veal

Procedure: Allow 30 minutes per lb., or until thermometer reads 170° F.

Baked Ham

Most hams on the market today have been tenderized during curing. They may be baked without previous soaking or broiling, except in the case of "country ham." If directions are given on the wrapper, they should be [illegible]

Brown Gravy for Roasts

Ingredients:
- ¼ cup drippings from roast
- 3 tablespoons flour
- 2 cups cold water or stock
- Salt
- Pepper

Procedure: Remove roast to hot platter Pour off drippings if they exceed more than ¼ cup. [illegible]

small frying pan, reduce flour and water accordingly and follow directions.

Miscellaneous

Bacon

Bacon may be pan-fried, broiled or baked. When 1 portion is prepared for the invalid's tray, the pan-frying method will be used generally. Usually 2 or 3 strips of bacon are allowed for each serving.

Baked Bacon

Procedure: Arrange strips of bacon in baking pan. Bake in moderately hot oven (400° F.) until golden brown. Drain on soft paper.

Pan-fried Bacon

Procedure: Place bacon without separating into strips in cold frying pan. Cook over low heat 2 or 3 minutes. Separate strips and turn occasionally until golden brown. Drain on soft paper

Broiled Kidneys

Procedure: Choose 1 veal kidney or 2 lamb kidneys for each serving. Split kidney, remove membrane and tubes, and soak in salted water 20 minutes. Drain and dry, dip in melted butter. Preheat broiling oven 5 minutes. Arrange alternate pieces of kidney and 1-inch squares of bacon on metal skewers, and broil 3 inches from the heat about 15 minutes, turning occasionally.

Pan-broiled Liver

Calf's liver is generally used for the patient's tray because it is both tender and delicate in flavor. Liver from beef, lamb or pig, which is less expensive, is also very good when properly cooked.

Procedure: Have liver sliced ¼ inch thick. Wipe with cloth and remove skin and tubes

"minute" steak may be cooked by a special [illegible]

[illegible] and broil from 2 to 3 inches below heat. Sear meat on both sides, reduce heat and continue cooking, turning occasionally. If an electric range is used, the door of the [illegible]

[illegible]

Pan-broiled Steak

Procedure: Wipe meat with cloth; heat [illegible] with salt and pepper, spread with softened butter if desired

Minute Steak

Procedure: Heat heavy frying pan until very hot and grease liberally. Sear steak quickly on both sides, lower heat and cook 2 minutes on each side Sprinkle with salt and pepper, spread with softened butter if desired

Broiled Hamburg

Ingredients:

- ¼ lb ground beef
- ¼ teaspoon salt
- Dash pepper
- ½ teaspoon cream or evaporated milk

Procedure· Mix beef with seasonings and moisten with cream or evaporated milk Form into a thick cake Make an indentation in the center and broil under moderate heat about 7 minutes on each side. Serve on [illegible]

[illegible] 3 minutes on each side Yield 1 serving

Broiled Lamb Chops

Procedure: Select loin or rib chops, single or double as desired Follow directions for broiled steak or pan-broiled steak For single chops allow from 12 to 15 minutes For double chops from about 15 to 20 minutes

Pan-broiled Pork Chops

Procedure: Have chops cut about 1 inch thick. Wipe with cloth, sprinkle with salt and pepper and dredge with flour Heat heavy frying pan and brown chops lightly on both sides in their own fat, turning frequently. Pour off excess fat as chops cook Cover and cook over very low heat from 25 to 30 minutes (until tender).

Broiled Ham

Procedure: Preheat broiling oven 5 minutes Trim skin and wipe meat with cloth, cut fat round edge in several places. Broil 3 inches below moderate heat, turning occasionally. Allow 10 minutes for slice ½ inch thick and 20 minutes for one ¾ inch thick After ham is broiled it may be sprinkled with brown sugar and returned to broiler just long enough to melt the sugar Allow ¼ lb for each serving

Pan-broiled Ham

Procedure: Trim skin and wipe meat with cloth, cut fat round edge in several places Heat heavy frying pan and grease with fat from ham. Cook over moderate heat turning often until well browned Allow ¼ lb for 1 serving

Veal Steak

Procedure: Select veal steak cut ½ inch thick. Dredge with flour, salt and pepper, and sauté in a small amount of butter or bacon fat, turning constantly until brown. Add ½ cup water, cover and simmer from 20 to 30 minutes (until tender). Allow ¼ lb for 1 serving.

Roasting

Tender cuts of meat such as ribs of [illegible]

General Directions for Roasting

Wipe meat with cloth, rub with salt and pepper and place fat side up in uncovered roaster. If meat thermometer is [illegible]

to buy any portion of chicken desired, this is helpful when meat is being reintroduced into the diet and when white meat of chicken has been specified by the physician It is also convenient when the convalescent patient has a special desire for some particular chicken dish

As it may be necessary for the nurse to supervise the preparation of boiled chicken, the method of preparation is included in this chapter. When chicken or other fowl is to be served at the family table, some of the breast meat should be reserved for the patient, unless other portions are preferred.

Poultry is generally purchased dressed and drawn It may be ordered split for broiling or cut in pieces for frying or other purposes. If singeing is necessary, hold the bird over direct heat and turn until all the hair has disappeared. Then wash inside and out under running water Remove pieces of red spongy lungs, remove oil sac above tail with a sharp knife and pin feathers with tweezers

Broilers and fryers entirely ready for cooking can be purchased packaged, both fresh and frozen The price per pound of edible meat is no more than that for other poultry which is weighed before it is completely dressed

Proper cooking, which develops and holds the delicate flavor of the meat, is important in preparing chicken for the

chicken after the broth has been extracted for soup A very palatable broth may be made from the bones of roast chicken or turkey if a pressure cooker is used Baby or squab chickens and Rock Cornish hens are about the same size as squab, the term used for young pigeon. As each provides 1 serving, they may be used to advantage for the single person or small family

POULTRY RECIPES

Boiled Chicken

Procedure· Choose a 5-lb fowl and have it disjointed at market Wash and place in kettle with 1 quart boiling water Add ½ cup celery leaves or 1 stalk celery, 1 sliced onion, 1 bay leaf, 4 peppercorns and 1 tablespoon salt Bring to boiling point, cover, and let simmer over low heat about 2 hours or until tender The time will de-

cups diced cooked chicken

Fricassee of Chicken

Ingredients·

1 boiled chicken
4 tablespoons butter
6 tablespoons flour
2 cups chicken stock
1 cup top milk
Salt
Pepper
2 tablespoons chopped parsley

Procedure. Follow directions for boiled chicken (*see* preceding recipe) Drain and reserve stock Melt butter, add flour, stir until well blended, and add chicken stock and milk gradually Stir constantly over low heat until sauce thickens and boils Add

Yield 6 servings

Creamed Chicken

Ingredients

1 tablespoon chicken fat or butter
2 teaspoons flour
¼ teaspoon salt
Pepper
¼ cup chicken stock
¼ cup milk
½ cup diced cooked chicken
1 teaspoon minced parsley

Procedure Melt butter, stir in flour and seasonings, and when well blended add chicken stock and milk slowly, stirring constantly over low heat until the mixture thickens and boils Add chicken and parsley.

if this has not already been done at the store. *Dredge with seasoned flour. Cook in* hot, well-greased frying pan about 5 minutes, turning occasionally until well browned. Add more fat as needed Bacon fat or butter is used generally for cooking liver Care should be taken not to overcook liver, for long cooking will make it tough. Allow ¼ lb. for 1 serving

Broiled Sweetbreads

Procedure: Wash sweetbreads, cover with boiling water, add 1 teaspoon vinegar and ¼ teaspoon salt. Bring to boiling point, cover and *simmer* over low heat *15 minutes* Drain, plunge in cold water, drain again and remove membrane and veins Drain and dry. Preheat broiling oven and grease rack. Brush sweetbreads with melted butter or salad oil and sprinkle with salt and pepper Broil 3 inches below the heat about 10 minutes, turning occasionally. Serve with melted butter flavored with lemon juice. *Allow 1 sweetbread for 1 serving.*

Creamed Sweetbreads

Ingredients:
- ½ boiled sweetbread
- 1 tablespoon butter
- 1 tablespoon flour
- ⅛ teaspoon salt
- Pepper
- ⅓ cup milk
- ¼ cup cream
- 1 teaspoon lemon juice
- 1 tablespoon minced parsley

Procedure: Prepare and boil sweetbread according to directions in preceding recipe, cut sweetbread into small pieces. Melt butter, stir in flour, salt and pepper; when blended stir in milk and cream gradually, and continue stirring over low heat until sauce thickens and boils Add lemon juice and parsley. Add sweetbread, reheat and serve on hot toast or in a croustade Yield 1 serving.

Creamed *Dried Beef*

Ingredients:
- 1 tablespoon butter
- ¼ cup shredded dried beef
- 2 teaspoons *flour*
- ¾ cup milk

Procedure: Melt butter in a small frying pan, add beef and cook until light brown Sprinkle with flour and blend. Add mi *gradually, stirring constantly over low he* until mixture thickens and boils. Serve *toast or on hot biscuits as desired. Yield* serving

Baked Hamburg

Ingredients:
- ¼ lb. ground beef
- Dash salt
- *Dash* pepper
- Dash mustard
- 1 small onion, sliced
- Melted butter

Procedure: Mix beef with salt, pepper an mustard. Form into flat cake, place i greased baking pan, top meat with ove lapping onion slices and brush with butte Bake about 10 minutes in moderately h oven (400° F.). Yield· 1 serving.

Scraped Beef

Procedure: Take a piece of round steal scrape with tablespoon to free from th connective tissue, season with salt and serv *as desired It may be spread between slice* of bread and served as a toasted sandwich or it may be formed into a ball and pan broiled slightly.

Meat Stews

For meat stews and other family-siz meat recipes, see Chapter 49.

CHOICE AND PREPARATION OF POULTRY

The term *poultry* is used to describ domestic birds such as chicken, squab turkey, guinea hen, goose and duck, and game such as quail, partridge and *pheasant Chicken and turkey are used* more than any other form of poultry in

served for use a day or two later. The nurse may be called upon to roast squab, baby chicken or partridge, or to prepare a broiler.

As it is now possib markets



Fig 118. Jellied consommé is refreshing on a warm day

over the cup or cream soup dish in which the soup is served

Hot crackers or Melba toast should be served separately on a small plate. Croutons may be placed in the soup just before it is to be served.

Jellied Consommé (Bouillon)

Ingredients.

- 1 tablespoon unflavored gelatin
- 2 tablespoons cold water
- ¾ cup well-seasoned soup stock or canned consommé
- 1 tablespoon lemon juice
- 1 slice or ½ lemon
- [illegible] minced parsley

and minced parsley or with cooked or canned small mushrooms

Jellied Tomato Bouillon

Procedure Follow directions for jellied consommé, substituting well-seasoned tomato juice for the soup stock or consommé

Jellied Madrilene

Procedure Follow directions for jellied consommé, using *equal parts* of soup stock or consomme and well-seasoned tomato juice

NOTE Jellied Madrilene can be purchased in canned form The can should be chilled in the refrigerator before it is opened. It should be beaten lightly with a fork before being served in bouillon cup

Vegetable Soup

Procedure Diced cooked vegetables, canned or fresh tomatoes, boiled rice or barley,

Reheat and serve on hot toast or split baking powder biscuits (p 531) or in tart shells Garnish with strips of pimiento if desired Yield 1 serving

Note *Chicken stock may be replaced by ¼ cup cream.*

Casserole of Creamed Chicken

Procedure· Follow preceding directions for creamed chicken. Place in small, buttered baking dish, sprinkle with buttered bread crumbs or with grated cheese and bake about 15 minutes in a moderately hot oven (400° F) until lightly brown.

Creamed Chicken with Mushrooms

Procedure: Follow preceding directions for creamed chicken, substituting ½ cup sliced cooked or canned mushrooms for an equal amount of chicken

Broiled Chicken

Procedure: Select broiler weighing from 2 to [illegible] skin side down on broiler rack 3 inches below heat Cook from 30 to 40 minutes, turning several times and basting frequently with melted fat Serve on hot plate with extra melted butter if desired

A broiler may be baked in the oven from 30 to 50 minutes until tender A high temperature (500° F.) should be used for the first 15 minutes, then reduced to moderate (375° F.) It should be basted occasionally with fat which accumulates at bottom of the pan One serving ¾ to 1 lb

Fried Chicken

Procedure: Have chicken cut into pieces for serving Wipe with damp cloth and sprinkle with salt and pepper. Dredge liberally with flour and rub flour into flesh Dredge again, continue rubbing until no more flour can be absorbed Fry in hot fat, which should be at least ½ inch in depth in frying pan Lard or vegetable shortening is used generally Turn chicken constantly until golden brown. When tested with fork, the juice should be colorless If chicken is not tender by the time it is brown, cover and remove from heat and let stand ½ hour to finish cooking by retained heat Serve with cream gravy if desired. To make cream gravy follow directions for cream sauce (p 503), substituting some of the fat in which the chicken has been cooked for the butter Allow ¾ lb for 1 serving

Roast Squab

Procedure: Clean squab, rub lightly inside and out with butter, and sprinkle with salt and pepper. Place breast side up in uncovered pan and roast in a very hot oven (500° F.) for 5 minutes until brown. Turn breast side down, reduce heat to slow (325° F.) and continue roasting about 20 minutes (until meat is tender). Serve with currant jelly.

[illegible] well-seasoned [illegible]

Roast Baby Chicken

Procedure: Follow preceding directions for roast squab

Roast Partridge

Procedure. Follow directions for roast squab (above).

Chicken Livers

Procedure. Chicken livers may be sautéed 2 or 3 minutes in butter or may be halved, dipped in melted butter or salad oil and placed on skewer for broiling under a moderate heat for about 2 minutes on each side

BROTHS, SOUPS AND JUICES

Meat soups, broths and juices are valued more because of the way in which they stimulate appetite than because of the very small amount of food value they contribute. As good quality canned broths and soups can be purchased, only a few recipes are given in this section

To Serve Soup. Bouillon cups or cream soup dishes rather than soup plates should be used and should be heated before soup is served. Covered soup bowls should be used when available, otherwise a saucer may be placed

Food Value
Shellfish
Other Foods Grouped with Fish
Digestibility
Place in the Menu
Selection and Care
Recipes

CHAPTER FORTY-FOUR

Fish, Including Shellfish

Fish and meat compare well in the chief nutritive constituent protein Fish, however, has fewer extractives, which are responsible for the characteristic flavors of meat. While various types of fish have a certain individuality of flavor, except in the case of shellfish, they do

communities far from sources of production to have a regular distribution of good-quality fresh fish Canned fish,

FOOD VALUE

Weight for weight, fish is not generally so high in calories as meat, because of the lower fat and the higher water content. Fish is rich in gelatin, which is soluble in hot water. For this reason more of the nutritive value is lost in boiling fish than in baking or broiling

As will be seen in Table 1, Part Four, there is little difference in the protein content of the various fish There is a great difference, however, in the fat content, which varies from less than 1 per cent to more than 12 per cent. This factor has led to the classification of fish under two heads fish low in fat and fish high in fat The amount of fat in all fish varies somewhat with the season of the year, with the time of spawning and with changes in feeding conditions. It may be noted that certain fish which have very little fat in the edible portion have a comparatively large amount in the liver Fish liver furnishes oil which is high in both vitamins A and D. Cod and halibut are commonly used, but mackerel, tuna, swordfish and several other species yield liver oils which are more potent

Salt-water fish are valuable because of their iodine content. The iron content

may be obtained in both fresh and

cooked noodles or vermicelli may be added to any type of stock. Allow ¼ cup of any one of these products or in combination to 1 cup stock If fat is allowed in the diet, diced raw vegetables such as carrots, potatoes, turnips and minced onion may be cooked 2 minutes in a small amount of butter before the addition of stock The saucepan should be covered and the soup cooked until the vegetables are tender Canned consommé, bouillon cubes or instant broth dissolved in water may replace stock.

Chicken Broth

family table, some of the stock from the boiled chicken which forms its base may be reserved for use on the patient's tray. The stock should be chilled, then skimmed, so as to be free of fat before it is reheated for the patient.

Beef Juice

Ingredients:
- ½ lb lean beef
- Salt

Procedure: Broil beef (about 4 inches square and 1 inch thick) on both sides. Two minutes should be sufficient

Lay beef on a plate, sprinkle with salt, cut in pieces, place in meat press or potato ricer and squeeze out all the juice Yield. About 2 ozs or 4 tablespoons juice.

Sufficient juice for 2 servings is generally prepared at one time To warm the second portion, place the juice in a cup, set cup in boiling water, stir juice constantly until it is a little more than lukewarm and serve at once.

Beef Tea

Ingredients:
- 1 lb. chopped lean beef
- 1 pint cold water
- ½ teaspoon salt

Procedure: Place finely chopped or ground beef in a fruit jar Add cold water and allow to stand 1 hour. Place jar in a saucepan of cold water with a cloth on the bottom of pan under the glass and heat the water over low heat Be careful not to let it boil. Keep below boiling for 2 hours Then slowly in-

ing or in reheating. Yield: 2 servings

(For soups other than those made from meat, see Chap. 47.)

STUDY QUESTIONS

1. Discuss the change in trend in meat consumption in the United States

2. Why must meat be handled carefully in its preparation for market and also in the home kitchen?

3. Give the reasons why meat is considered to be a valuable part of the diet State why liver and other organs have a particularly high rating.

4. Discuss the digestibility of meat Why is the white meat of chicken often served early in convalescence?

5. Outline the principles of meat cooking. Why should particular precautions be used in cooking pork?

6 Compare the vitamin values of raw and cooked meats

7. What is the value of meat soups, broths and juices?

See Bibliography in Part Four for books on Cookery.

SHELLFISH

Oysters

Oysters are among the most important of the shellfish The usual season for oysters opens the first of September and closes the first of May They are not a desirable article of food during the summer, which is the spawning season After harvesting, oysters should be kept alive until required for use.

Among the best-known varieties are blue points, lynnhavens, rockaways, saddle rocks, shrewsburys, etc. Such

given commonly to oysters not exceeding 2 or 2½ inches in length.

Oysters may be contaminated by water polluted by sewage. Oyster beds which supply commercial distributors are located in safe waters Shucked oysters may become contaminated in the process of shelling, because of improper handling.

Oysters in the shell may be served raw, broiled or baked, and out of the shell stewed, creamed, scalloped, fried and roasted In choosing oysters those with tightly closed shells should be selected Shucked oysters should have a good odor, should not be ropy or slimy, and should not be "bloated" by placing them in fresh water When oysters are cooked, the period should always be short to avoid toughening

Clams

Clams rank next to oysters in

very small round clam is known as the little neck.

Clams are most abundant during the closed oyster season Little-neck clams are served raw and often take the place of blue points on hotel and restaurant menus They do not differ much from oysters in food value

Quahaugs, or large clams, are used for chowder, broth and frying Soft-shelled clams are boiled, steamed and used in chowders In choosing clams, those with unbroken shells should be selected. If open, they should close quickly when

Mussels

Mussels are not generally used for food in the United States, but are used extensively in France, Holland and England. They are found in both fresh and salt water.

Scallops

Scallops, like oysters, are bivalves, but

quart or pound and may be broiled, friend, baked or used for chowder.

Lobsters

Lobsters are salt-water crustaceans

Live lobsters heavy for their size should be chosen There should be an active, quick response to touch. After boiling, the tail should spring back when straightened out This test shows that the lobster was alive before cooking Lobsters may be served boiled, baked, creamed or broiled

Large crawfish are sometimes called

canned form. The roe of the sturgeon, which is known as caviar, is obtainable in salted form. So-called fresh caviar is mildly salted and packed in tin or in glass It is much more expensive than the caviar which is more highly salted, packed in barrels for export and later canned. Caviar, which was once a common product in the United States before the American sturgeon was practically exterminated, is now imported from Russia. A small amount of inexpensive white-fish caviar is produced in the United States. In contrast with shad roe, which is used as a main dish, caviar is used merely as an appetizer and seldom has a place in the diet of an invalid.

Shellfish may be divided into two classes: mollusks and crustaceans. Mollusks include oysters, clams, mussels and scallops; crustaceans include lobsters,

are all of approximately the same composition As a class, they are high in protein and low in fat.

Composition of Typical Fish

Kind	Water Per Cent	Protein Per Cent	Fat Per Cent	Calories per 100 Gm.	Calories Per Lb
		Low in Fat			
Bass	77	21	2	102	463
Cod	83	17	Tr.	68	309
Flounder	83	15	1	69	322
Haddock	82	18	Tr.	68	309
Pike	80	19	1	85	386
Trout, brook	78	19	2	94	427
		High in Fat			
Bonito	68	24	7	159	722
Herring	67	18	13	139	631
Mackerel	68	19	12	184	835
Salmon, Pacific	63	17	17	221	1,003
Shad	70	19	10	166	754
White Fish	70	23	7	155	704

Proximate Composition of Shellfish

Description	Water Per Cent	Protein Per Cent	Fat Per Cent	Carbohydrate Per Cent	Calories per 100 Gm	Calories Per Lb.
Clams, long and round	80	13	1	2	82	372
Crabs	80	17	3	1	86	390
Lobsters	79	16	2	1	86	390
Mussels	77	14	2	5	94	427
Oysters	80	10	2	6	82	372
Scallops	80	15	Tr.	3	72	327
Shrimps	66	27	1	1	85	386

SHELLFISH

Oysters

Oysters are among the most important of the shellfish. The usual season for oysters opens the first of September and closes the first of May. They are not a desirable article of food during the summer, which is the spawning season After harvesting, oysters should be kept alive until required for use.

Among the best-known varieties are blue points, lynnhavens, rockaways, saddle rocks, shrewsburys, etc. Such names formerly indicated the locality in which the oysters were grown, but this no longer holds, the name generally denoting merely the size of the oyster. For example, the name *blue point* is now given commonly to oysters not exceeding 2 or 2½ inches in length

Oysters may be contaminated by water polluted by sewage. Oyster beds which supply commercial distributors are located in safe waters Shucked oysters may become contaminated in the process of shelling, because of improper handling.

Oysters in the shell may be served raw, broiled or baked

with tightly closed shells should be selected Shucked oysters should have a good odor, should not be ropy or slimy, and should not be "bloated" by placing them in fresh water When oysters are cooked, the period should always be short to avoid toughening

Clams

Clams rank next to oysters in

are dug with shovel and rake. The long soft-shelled clams are

very small round clam is known as the little neck

Clams are most abundant during the closed oyster season Little-neck clams are served raw and often take the place of blue points on hotel and restaurant menus They do not differ much from oysters in food value

Quahaugs, or large clams, are used for chowder, broth and frying. Soft-shelled clams are boiled, steamed and used in chowders In choosing clams, those with unbroken shells should be selected. If open, they should close quickly when

Mussels

Mussels are not generally used for food in the United States, but are used extensively in France, Holland and England They are found in both fresh and salt water.

Scallops

Scallops, like oysters, are bivalves, but only the muscle which opens and closes the shell is used for food Two types of scallops are found in the waters of the Atlantic and the Gulf of Mexico Those which are found in shallow waters are smaller and more tender than the deep-sea scallops. Scallops are sold by the quart or pound and may be broiled, friend, baked or used for chowder

Lobsters

Lobsters are salt-water crustaceans and are found in Atlantic waters from Newfoundland to New Jersey. They are most plentiful in summer. Lobsters have a dark-greenish hard shell which turns red during cooking.

Live lobsters heavy for their size should be chosen There should be an active, quick response to touch After boiling, the tail should spring back when straightened out This test shows that the lobster was alive before cooking Lobsters may be served boiled, baked, creamed or broiled

Large crawfish are sometimes called

lobster. The flavor is not unlike that of lobster. Frozen South African rock lobster tails are now in rather general distribution in city markets. As the fish are taken from the very cold antarctic current, trimmed and fast-frozen immediately, the quality of the meat is very good and suitable for boiling and broiling. The tails range in size from 4 to 16 ounces.

Crabs

Several types of crabs are found along

from Atlantic waters.

Shrimps

Atlantic and the Pacific coasts. A large

canned form. Shelled, deveined frozen shrimp—some of which is breaded—is also available.

OTHER FOODS GROUPED WITH FISH

Turtles. Both fresh- and salt-water turtles are used. The green turtles grow to an enormous size, some weighing from 50 to 100 pounds. They are used principally for making soups, some of the flesh being included in the soup.

Terrapins. Terrapins are found in fresh and salt water, and are shipped from the South packed in seaweed. They little. The diamond-back terrapin is the most famous variety. Only the female is used for food, the choicest or "full cow" terrapin containing eggs

Frogs' Legs. Frogs' legs are utilized in some parts of the United States, only the hind legs being eaten. They are easily digested and have a very delicate flavor, much like the white meat of chicken. They are served broiled or fried.

DIGESTIBILITY

Fish, in general, is easily digested because of its short and tender muscle fibers. The controlling factor of digestibility is its fat content; in the richer varieties the fat delays food passage

be consulted.

Shellfish vary greatly in the rapidity with which they are digested. Oysters are among the most valued foods for the patient because they digest easily. Lobster is seldom used because of the coarseness of the meat and the strong flavor. Other shellfish are usually well tolerated, although there may be allergies toward one or more of the members of the shellfish family and occasionally to other types of fish as well.

PLACE IN THE MENU

Fish and shellfish may be used to advantage in the convalescent's diet if the patient likes this type of food. The texture of fish is so tender that it may be introduced as soon as solid food is allowed. Fish such as salmon and shad, whose flesh contains fat, is sometimes reserved for later use. Oysters are used more than any other shellfish, although clams, crabmeat and shrimp will offer a desirable variety during the latter part of convalescence. Lobster may have a place on a tray prepared for a convalescent patient under no dietary restrictions.



Fig. 119. Broiled halibut steak with two vegetables.

SELECTION AND CARE OF FISH

Fish is offered on the market today in a number of different forms Coastal cities and regions bordering on the Great Lakes are well ...

packed in cartons before freezing are available in most markets Frozen fish should not be defrosted until just before it is to be used. Fish should be stored in a covered utensil in the refrigerator When frozen fish is bought in cartons of family size, it should be allowed to thaw on the shelf of the refrigerator or at room temperature for a number of hours, then ...

... Canned

preservation—drying, smoking, salting and pickling By such methods fish will keep in good condition a long time. Fish so treated is generally purchased just before it is to be used.

FISH RECIPES

The general rule for cooking fish may be summed up in one sentence short cooking just before serving is most important This rule is particularly applicable in the case of broiled and panbroiled fish, which after cooking dries out quickly The test for cooking is simple When tried with a fork, the flesh should flake. Sliced or quartered lemon is the chosen garnish for fish for both

lobster. The flavor is not unlike that of lobster. Frozen South African rock lobster tails are now in rather general distribution in city markets. As the fish are taken from the very cold antarctic current, trimmed and fast-frozen immediately, the quality of the meat is very good and suitable for boiling and broiling The tails range in size from 4 to 16 ounces.

Crabs

Several types of crabs are found along the Atlantic and the Pacific coasts. Soft-*shelled crabs are small Atlantic crabs* which have shed their shells. The meat of the hard-shelled crab is usually picked after boiling and shipped packed in ice [illegible]

from Atlantic waters.

Shrimps

Shrimps from Southern waters, which are used commonly, actually belong to the prawn family. True shrimps are found to some extent along both the [illegible]

also available.

OTHER FOODS GROUPED WITH FISH

Turtles. Both fresh- and salt-water turtles are used. The green turtles grow to an enormous size, some weighing from 50 to 100 pounds. They are used principally for making soups, some of the flesh being included in the soup

Terrapins. Terrapins *are found in* fresh and salt water, and are shipped from the South packed in seaweed. They are in season from November to April. *Like the lobster,* they are cooked alive Because of the scarcity of terrapin and the increased cost, they are used very little The diamond-back terrapin is the most famous variety. Only the female is used for food, the choicest or "full cow" terrapin containing eggs.

Frogs' Legs. Frogs' legs are utilized in some parts of the United States, only the hind legs being eaten. They are easily digested and have a very delicate flavor, much like the white meat of chicken. They are served broiled or fried

DIGESTIBILITY

Fish, in general, is easily digested be*cause of its short and tender muscle* fibers. The controlling factor of digestibility is its fat content; in the richer varieties the fat delays food passage [illegible]

be consulted.

Shellfish vary greatly in the rapidity with which they are digested. Oysters are among the most valued foods for the patient because they digest easily. Lobster is seldom used because of the coarseness of the meat and the strong flavor. Other shellfish are usually well tolerated, although there may be aller*gies toward one or more of the members* of the shellfish family and occasionally to other types of fish as well.

PLACE IN THE MENU

Fish and shellfish may be used to advantage in the convalescent's diet if the patient likes this type of food. The texture of fish is so tender that it may be introduced as soon as solid food *is al*lowed Fish such as salmon and shad, whose *flesh contains fat, is sometimes re*served for later use. Oysters are used *more than any other shellfish,* although clams, crabmeat and shrimp will offer a desirable variety during the latter part of convalescence. Lobster may have a place on a tray prepared for a convalescent patient under no dietary restrictions.

Procedure: Leftover cooked fish or canned tuna fish, salmon, crabmeat or shrimp may be used Melt butter, stir in flour, salt and pepper. When well blended, add milk slowly, stirring constantly over low heat until the mixture thickens and boils Add fish, nutmeg and more salt if necessary One teaspoon lemon juice may be added if desired. Reheat, serve on toast or in patty shell. Sprinkle with minced parsley or chives Yield 2 servings

Creamed Fish with Mushrooms

Procedure. Follow directions for creamed fish (see above), adding 2 tablespoons sliced cooked or canned mushrooms with the fish

Codfish, Creamed

Ingredients.

- ½ cup salt codfish
- ½ cup cream sauce (p 503)

Procedure: Soak codfish in cold water 20 minutes to remove some of the salt, drain Cut in small pieces and combine with cream sauce, from which salt has been omitted, and heat thoroughly Yield 1 serving

Scalloped Fish

Ingredients

- 2 tablespoons butter
- 1 cup soft bread crumbs
- ¼ teaspoon salt
- Pepper
- 2 teaspoons lemon juice
- ½ cup flaked cooked or canned fish

Procedure· Leftover cooked fish or drained canned tuna fish or salmon may be used. Melt butter, add crumbs and stir with a fork until well mixed. Add salt, pepper and lemon juice Arrange fish and crumbs in alternate layers in a small, greased baking dish Bake about 5 minutes in a hot oven (450° F.) until crumbs are golden brown. Yield 2 servings

SELECTION AND CARE OF SHELLFISH

Great care must be taken in the handling and the preparation of shellfish for shipment Lobsters, oysters and clams in the shell are packed in ice and shipped alive to market points South African rock lobster tails are fast-frozen for shipment to distant points. Shucked oysters are packed in metal containers or waxed cartons which should be refrigerated or surrounded with ice. Shucked oysters are also quick-frozen after packing in cartons They should not be thawed until ready to use Both soft- and hard-shell crabs are shipped alive, but the majority of the meat from the latter is boiled, picked, placed in can and packed in ice for shipment Scallops are usually sold in fresh form, although a few are now frozen All shellfish after purchase should be stored in the refrigerator and used within 24 hours.

SHELLFISH RECIPES

Creamed Oysters

Ingredients

- 1½ tablespoons butter
- 1½ tablespoons flour
- ¼ teaspoon salt
- *Pepper*
- ½ cup milk
- 6 oysters
- 1 tablespoon diced raw celery

Procedure Melt butter in a small saucepan, stir in flour, salt and pepper, stir in milk gradually and continue stirring over low heat until sauce thickens and boils Add drained oysters and celery and cook over low heat about 2 minutes until edges of the oysters curl. Serve on hot toast or in patty shell, garnish with strips of pimiento or minced parsley Yield. 1 serving

Panned Oysters

Ingredients

- 6 oysters
- ½ tablespoon butter
- Salt
- Pepper

Procedure Drain the oysters, pour into hot dry saucepan and cook, stirring constantly until edges curl Add butter and seasoning. Serve on toast Yield 1 serving.

Scalloped Oysters

Procedure Follow directions for scalloped fish (on this page), substituting 6 raw oysters for the flaked fish.

appearance and flavor. If a sauce is used, it should be flavored either with lemon or some other pungent ingredient.

Fish, Baked Fillets

Procedure: Wash fish fillet and wipe with [illegible]

tartare sauce in a lettuce cup, if desired, and lemon quarter.

Tartare sauce Mix 1 teaspoon finely minced olives or pickles and a few drops onion juice with 1 tablespoon mayonnaise.

Broiled Fish

Procedure. Wash fish thoroughly, wipe with cloth Brush with melted butter or salad oil, sprinkle with salt and pepper. Place skin side down on well-greased broiler rack, broil 2 inches from heat from 10 to 15 minutes (until brown) The flesh should flake when tried with a fork Serve with melted butter and sliced lemon. Allow 1 small fish or ½ lb fish fillet for each serving.

Broiled Halibut Steaks

Procedure: Let halibut thaw at room temperature until thawed enough so that steaks can be separated Place on greased pre- [illegible]

Sprinkle with salt, pepper and chopped [illegible]

Pan-broiled Fish

Procedure: Wash fish thoroughly and wipe with cloth Roll in seasoned flour, corn meal [illegible]

Poached Fish (Boiled Fish)

Ingredients:
- 1 teaspoon butter
- 1 teaspoon chopped celery
- 1 teaspoon chopped carrot
- 1 sliced onion
- 1 peppercorn
- ⅛ teaspoon salt
- 1 teaspoon vinegar
- 2 cups water
- ½ pound fish fillet

Procedure: Melt butter, add vegetables and cook ½ minute. Add seasonings, vinegar and water. Cover and bring to boiling point. Boil 5 minutes Wash fish, tie in cheesecloth, place in water and let simmer from 20 to 30 minutes, until fish flakes when tried with a fork. Remove from cheesecloth and drain. Serve with egg, cheese or hollandaise sauce (*see* Sauces for Vegetables, p 503) or chill and flake for use in recipes for creamed or scalloped fish (see below). Yield· 1 generous serving

Egg Sauce for Fish

Ingredients:
- 1 tablespoon butter or margarine
- 1 tablespoon flour
- ½ cup fish stock
- ½ cup sweet or sour cream
- 2 teaspoon lemon juice
- ½ hard-cooked egg
- 1 teaspoon minced parsley

Procedure: Melt butter or margarine in small saucepan, stir in flour. When well blended, stir in the stock. Continue stirring over low heat until mixture thickens slightly. Stir in cream Add lemon juice and hard-cooked egg white cut into pieces Add salt, if needed Reheat and pour over poached fish fillet. Sprinkle with sieved hard-cooked egg yolk and minced parsley.

NOTE· Milk may replace the cream if a less rich sauce is desired

Creamed Fish

Ingredients
- 1½ tablespoons butter
- 1½ tablespoons flour
- ¼ teaspoon salt
- Pepper
- ¾ cup top milk
- ½ cup flaked fish
- Nutmeg
- 1 tablespoon minced parsley or chives

CHAPTER FORTY-FIVE

Vegetables

Under the term *vegetables* are grouped foods representing practically every part of edible plants, leaves, stems, seeds and seed pods, flowers, roots, tubers and fruits While vegetables vary in nutritive content, in general they make an important contribution, especially because of the vitamins and the minerals that they contribute (*see* Chaps 6-8). This apparently is controlled by the nature of each plant. The nature of the soil in which vegetables are grown does not seem to have much bearing upon the nutritive content. However, if the soil is properly fertilized, the yield per

variety they give to the diet through texture, flavor, odor and color (*see* Chap 2).

BOTANICAL CLASSIFICATION

Botanically, vegetables fall into different classifications according to plant structure However, this does not indicate in general their nutritive value

Leafy Vegetables The leafy vegetables—often called green vegetables—contain less than 10 per cent of solid matter Outstanding members of the group are spinach, cabbage, Brussels sprouts, lettuce and greens of all sorts

ally considered a fruit because of the need of sugar in its preparation and the way in which it is used in the menu. Kohlrabi is a combination of stem and root.

Roots and Tubers Vegetables which grow underground are classified as roots and tubers Of these, beets, carrots, salsify, turnips, sweet potatoes and parsnips are true roots, while potatoes, Jerusalem artichokes and peanuts, the last used almost entirely as nuts, are tubers

Baked Oysters Casino

Ingredients:
- 6 oysters, in shells
- 1 tablespoon finely minced green pepper
- 1 strip bacon, finely minced
- ¼ tablespoon lemon juice
- Dash pepper

Procedure: Have raw oysters opened at market Arrange on half shells on pie plate Sprinkle each with minced green pepper, minced bacon, lemon juice and pepper. Bake in hot oven (450° F.) about 10 minutes (until edges of oysters curl). Yield· 1 serving

Clams, Steamed

Ingredients:
- 1 pint clams
- ⅛ cup boiling water
- 2 tablespoons butter, melted
- 1 teaspoon lemon juice

Procedure: Scrub clams with brush and wash under running water until sand has been removed Place in kettle with boiling [illegible]

1 serving

Scallops, Baked

Procedure: Wash and drain ¼ lb scallops Roll in seasoned fine dry bread crumbs Arrange in small, greased, shallow baking dish. Sprinkle with melted butter or with 1-inch pieces cut bacon Bake under broiler about 4 inches from moderate heat about 10 minutes

Scallops, Scalloped

Procedure: Follow directions for scalloped fish (p 493), substituting ¼ cup whole bay scallops or ¼ cup cut sea scallops for the flaked fish.

Shrimps en Brochette

Procedure. Arrange cooked shrimps alternately with 1-inch pieces bacon on metal [illegible]

South African Rock Lobster Tails

[illegible]

about 1 minute for each ounce of weight should be allowed after water reboils Drain lobster tails, drench with cold water and cut inner membrane or shell with scissors Pull out meat with fingers. Tails may be [illegible]

[illegible]

5 minutes Turn, spread with butter or margarine and broil 6 to 9 minutes, depending upon size, until meat is tender when tried with a fork

STUDY QUESTIONS

1. Compare fish and meat for food value and flavor.

2. Name several types of fish that could be used when necessary to keep fat intake low.

3. Which shellfish appear most commonly on the menu? Which are chosen most often for the convalescent diet, and why?

4 Give the principles for the selection and the care of fish.

5. State the principles for cooking fish.

See Bibliography in Part Four for books on Cookery.



Fig 120. A vegetable plate showing a golden sweet potato or yam with delicate white cauliflower

tables are exceedingly variable, depending upon the type of vegetable and the method of cooking Furthermore, available data are meager and difficult to evaluate The percentage of loss may be reduced materially by cook[illegible] little water [illegible]

[illegible] pot- [illegible] countries, where fresh fruits are scarce and expensive. Thus, it is worthy of note that broccoli, Brussels sprouts, kale, green peppers and potatoes, all of which are grown and used in northern climates, retain more than 50 per cent of their vitamin C when properly cooked

Mineral Content. The mineral content of vegetables is significant in the diet The calcium, the phosphorus and the iron make them as a class useful contributors to the specific needs of the body for these minerals At the same time, the alkaline residue which they leave after digestion and absorption tends to balance the acid residue of meats and cereals and thus aids in maintaining the neutrality of the blood Reference to Table I, Part Four, will show that legumes—under which heading are included dried beans and peas and lentils—have particularly high mineral value Of course, this will be reduced per serving after they have been soaked and cooked, but they are still good source Potatoes, because they are eaten so often, make a larger contribution of minerals than would appear from composition figures

Leafy green vegetables are naturally high in mineral content, but not all of this is available Knowledge of the availability is at present inadequate The utilization of the calcium depends upon the amount of oxalic acid present. While greens score well in the case of iron, it may be only partially available. When vegetables are cooked, there may be some loss of minerals in the cooking water. This is another reason why a minimum amount of water should be used and the vegetable liquor either served with the vegetable or used in a sauce or soup

or underground stems. Onions are actually bulbs.

Flower Vegetables. Cauliflower and broccoli are examples of the flower type of vegetable. The tips of asparagus are flower buds. Brussels sprouts may be classified as a flower or as a leafy vegetable.

Fruits Classed As Vegetables. Vegetables which are essentially the fruits of the plants are tomatoes, peppers, cucum-

legumes All are found in seed form, encased in pods. Both pods and seeds of young beans are eaten in the form of snap beans. Peas and some beans are shelled and used as green vegetables. In dried form, peas, beans and lentils are largely used and, unlike other vegetables, serve as a meat substitute because of their high protein content. Soybeans, which are high in both protein and fat, differ from other legumes. Grains which are used for flour and other cereal products are also seeds.

Edible Fungi. The fungi are plants characterized by an entire lack of chlorophyll, the green coloring matter which enables plants to make food from the carbon dioxide of the air. The edible varieties are commonly known as mushrooms, the inedible are popularly called toadstools, especially the injurious ones, many of which are extremely poisonous. Research work in regard to the food value of cultivated mushrooms shows

FOOD VALUE

In general, vegetables are valued more highly for their vitamin and mineral contributions than for their other nutrients. They differ greatly, however, in these respects, as a comparison of one vegetable with another through consultation with Table No. 1, Part Four, will demonstrate. Green and yellow vegetables are the best sources of carotene, the provitamin A. First on such a list are dandelion greens, carrots, turnip greens, spinach, sweet potatoes, kale, beet greens, collards and mustard greens Next in order come winter squash, broccoli, chard, lettuce, tomatoes, asparagus, green peas and string beans. (*See* Fig 19, Chap. 7.) White celery and peeled cucumbers are lacking in this vitamin, but Pascal celery probably will be found to be as rich as its color would indicate, and it is already known that unpared cucumbers supply vitamin A.

Vegetables in general are a more important source of ascorbic acid than has been recognized, as almost all contribute at least a small amount. The tomato is the most important source, not only because of its natural high content but because this is not destroyed by the canning process. Because tomatoes are used so much, they are more important in the meal plan than some other vegetables which are not eaten daily but may rate higher in ascorbic acid content. The best contributors in order of ascorbic acid content are turnip greens, green pepper, broccoli, kale, mustard greens and Brussels sprouts Cauliflower, spinach and cabbage come next in order. Potatoes, white or sweet, while less high in vitamin C than some of the other vegetables, are used in such quantities that they add materially to the total of the day. This is also true of lettuce and other salad greens when they are used often. (*See* Fig. 23, Chap. 8.)

As can be seen by consulting Table 1, Part Four, and illustrations in Chapter 8, vegetables supply varying amounts of thiamine, riboflavin and niacin of the B complex group Again, greens are high on the list as a source. Peas and potatoes also rate well Even when amounts are small, vegetables as a class play a part in the accumulation of the daily total of the B complex.

Vitamin Loss in Cooking. The losses of vitamins in the cooking of vege-

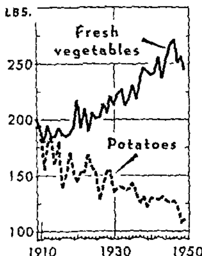


Fig 121. Showing consumption of vegetables per person The per capita consumption of fresh vegetables, including melons, has increased about one sixth since 1909, while the consumption of commercially canned vegetables has more than doubled. On the other hand, per capita consumption of potatoes decreased about one third during the period 1909 to 1943, and sweet-potato consumption declined about one fourth.

sary low temperature There is an increasing use of the home freezer for this purpose by those who raise their own products

Frozen products, fresh and of good quality, prepared and packed properly for freezing, lose little of their natural food value during storage at the proper temperature.

DEHYDRATED OR DRIED VEGETABLES

Dehydrating by some means of drying is the oldest method of preserving vegetables Except in the case of the legumes such as peas, beans and lentils, this process had been superseded largely by canning and freezing until war demands for conservation of space in shipment created a new interest in dehydrated products Many research projects in the interest of preserving flavor, texture and vitamins of vegetables and some fruits were undertaken with varying success These products were known as dehydrated foods in contrast with dried beans and peas As with the latter, it is necessary to reconstitute them by soaking in cold water for a specified time before cooking Instant mashed potatoes, a comparatively new product, need no soaking and only the addition of boiling water and milk to be ready for serving. They have been accepted with enthusiasm They can be successfully prepared in family or smaller quantities

PLACE IN THE MENU

A well-rounded menu will have vegetables in some form at both midday and evening meals Effort should be made to serve at least 2 vegetables besides potatoes, one of them in raw form as a salad or relish One green or yellow vegetable is suggested for daily use. When a variety of such vegetables is not available, a double portion of any leafy green vegetable in salad form may be used

PREPARATION AND COOKING

Under modern conditions of growing, shipping and distributing, almost all fresh vegetables can be found in market throughout the year, regardless of season To supplement the fresh vegetables which are shipped from the South and

Protein is to be found in the dried legumes in a quantity which qualifies them as a substitute for animal protein. However, its quality is not so high, and it is not so well utilized in the body. Soybeans are in a somewhat different classification, as their caloric value is chiefly in the form of protein and fat, and they are almost starch free. The quality of the protein is good, and its comparative value is being studied further. While the percentage value of the protein in most fresh vegetables is not high, it is enough to be considered.

Caloric Value. The caloric value of vegetables is generally inverse to water content. The range in value is from [illegible]

[illegible] in protein as well as in carbohydrate, the caloric contribution is generally supplied by the starch content, in which potatoes are particularly high. A few vegetables, notably beets and sweet potatoes, are comparatively rich in sugar. Certain young vegetables, such as peas and corn, have carbohydrate in the form of sugar which changes to starch as the vegetables mature. Available carbohydrate, which is the sum of starch, dextrin and sugar, has been determined for [illegible]

[illegible] case of soybeans

Almost all vegetables contain large amounts of the nondigestible forms of carbohydrate known as cellulose and hemicellulose, which are useful as bulk [illegible] residue without unduly increasing the daily caloric intake

DIGESTIBILITY

The normal person can digest vegetables easily. Tender young vegetables are often served raw as relishes or salads. To the standard list of salad vegetables, which includes greens, tomatoes, cucumbers, celery, cabbage, onions and radishes, have now been added thinly sliced carrots, green peppers, turnips and flowerets of cauliflower. However, discretion should be used in offering a convalescent patient salads and relishes of pungent flavor.

Discretion also should be shown in serving cooked vegetables, as some [illegible]

[illegible] for feeding infants may be found a convenience.

CANNED VEGETABLES

Canned vegetables provide out-of-season products which contribute practically the same food value as cooked fresh vegetables. Canning factories are distributed throughout the country in the center of producing districts. The products are picked as soon as they have reached the proper stage and are taken immediately to the factories, where they are cleaned, prepared and packed at once in cans or glass jars, which then are subjected to pressure heat. The scientific methods used for the preservation of perishable foods guarantee that the products will be safe and wholesome.

FROZEN VEGETABLES

Quick-frozen vegetables are now widely accepted as equal or superior in food value to fresh vegetables other than those freshly picked from the garden Ready as they are for cooking, they have proved to be a great convenience. The distribution of commercial products has widened every year as dealers became convinced that it was worth while to purchase the refrigerated equipment necessary for their storage In large cities, stores which deal only in frozen products are increasing in numbers Many towns offer locker facilities where green vegetables and other products may be frozen and stored at the neces-

the loss of natural flavor and texture. Some research work done at the University of Southern California showed that a very small amount of soda had no effect upon the vitamin content of peas cooked a minimum time which was shortened by the use of the soda It is not known as yet whether or not other vegetables react in the same manner However, the practice of adding soda is not recommended, because both in the home and in institutions, vegetables are apt to stand for a time before being eaten, and if left over and warmed up the soda tends to increase vitamin losses and still further affect flavor and texture

General Rules for Cooking

1. Use only enough water to cover the bottom of the pan to a depth of ½ inch (Exceptions to this rule are noted by an asterisk.) Spinach and other tender greens need no water

2 Bring water to boiling point and add salt before vegetable is added.

3. Cover tightly and cook over low heat only until vegetables are tender

4 Do not drain vegetables of mild flavor after cooking, unless the liquid is to be used in preparing a sauce

5. Vegetables may be baked in tightly covered casseroles when the oven is being used for some other purpose The time of cooking will be about one and a half times again as long as for boiling

6 Variations from the general rules: whole artichokes, cauliflower and cabbage should be placed head up in utensil, and the amount of water should be increased to 1 inch Stalks of asparagus and broccoli cook best in a large skillet. The stalks should be arranged side by side in the boiling salted water. The skillet should be covered For corn on the cob, potatoes, parsnips and turnips, water to a depth of 1 to 2 inches will be needed, depending upon the

be used

Timetable for Cooking

As vegetables differ in texture according to maturity, directions for cooking time can only be approximate.

Vegetable	*Minutes*
Artichokes	
American or Jerusalem	15-20
French or Globe*	20-30
Asparagus*	15-20
Beans	
String	15-30
Lima	20-30
Beets	20-60
Beet greens	10-20
Broccoli*	15-25
Brussels sprouts	10-20
Cabbage	5-10
Carrots	15-30
Cauliflower	10-30
Celery	10-15
Corn*	5-10
Cucumbers	10-15

Vegetable	*Minutes*
Dandelion greens	10-20
Eggplant	10-15
Kohlrabi	20-30
Mushrooms	7-10
Okra	20-25
Onions	20-40
Parsnips*	30-50
Peas	6-15
Potatoes*	
White	20-30
Sweet	20-30
Spinach	6-10
Squash	
Summer	10-20
Winter	20-30
Turnips*	15-60

* See General Rules for Cooking, No. 1, above

the Far West to markets thousands of miles away and the local products which are in season, there are as well the quick-frozen vegetables, the quality and the price of which are stable throughout the year. In addition, there is an ever-increasing variety of canned vegetables. With so much from which to choose there is no reason, except a dislike of certain products, why the menu should not be varied daily. Prejudices against certain vegetables may often be overcome by serving them well cooked with attractive dressings.

The care of vegetables in the home kitchen, for use in either raw or cooked form, is important. The length of time during which they will keep in good condition depends upon the type and the facilities for storage. Root crops, such as turnips, potatoes, carrots and beets, lose their ascorbic acid content slowly, [illegible]

such as string beans. Vegetables such as peas and Lima beans should not be shelled until just before they are to be cooked if a large loss is to be avoided. All green vegetables show less loss under refrigeration than under room temperature. Experiments show that when stored in the refrigerator salad greens, celery, young carrots, peas, radishes, parsley, broccoli, cauliflower and tomatoes should be covered, while cucumbers, green and Lima beans, eggplant and summer squash may be left uncovered.

For detailed directions for vegetables to be served raw, see the next chapter on salads and relishes

Vegetables should be washed thoroughly to remove soil and traces of spray. Root vegetables should be scrubbed, asparagus, spinach and other greens should be washed under running water to remove sand. Vegetables such as potatoes and carrots should not be pared or scraped until just before they are to be used. Peas and beans should not be shelled or corn husked until just before they are to be cooked Outer leaves of [illegible]

water to draw out insects, only a few minutes should be allowed Soaking should be done before cutting or shredding. A larger loss of vitamins occurs when vegetables are cut in small pieces. Grated carrots, for instance, lose vitamins more quickly than the sliced vegetable.

When possible, vegetables should be [illegible]

carrots demand a longer time to cook than those which have been sliced. All vegetables should be cooked as short a time as possible, as long cooking destroys vitamins and changes flavor, color and texture Only a small amount of water should be used when vegetables are boiled. There will be a very small amount of evaporation if the utensil is tightly covered and if cooking is done over low heat A heatproof glass pot will demonstrate this fact, although the same results are achieved by any type of saucepan when the cover really fits. The use of a pressure cooker for cooking vegetables has improved the quality of some of those served on the American table, although for many young green vegetables little time is saved, and the results are no better than when the above directions are followed in using the saucepan.

The use of baking soda in the cooking of green vegetables has been frowned upon by nutritionists, because an alkali such as soda is known to hasten destruction of the vitamins of the B complex and ascorbic acid. Good cooks also have objected to the use of soda because of

butter, with cream or with a sauce. Butter and cream are used more often with vegetables than any other dressing. Vegetables cooked in a small amount of water need not be drained When ready to serve, add 1 or 2 tablespoons butter

serves as a garnish and is poured over the drained vegetable just before it is served. Sauces of this type may be served in a separate dish if desired.

Flavored Butters

The butter may be melted and combined with lemon juice to taste before the vegetable is dressed. Spinach, string beans, cauliflower, broccoli, asparagus and beets may be dressed with lemon butter. Minced parsley may be added with the butter for dressing potatoes Cut mint leaves may be used with peas Butter may be browned slightly in a separate utensil and poured over such vegetables as cauliflower, broccoli or asparagus A few grated dry bread crumbs may be browned in butter for dressing cauliflower, broccoli, asparagus and onions

Sauces

Sauces should blend or contrast in flavor with the vegetable with which they are to be served They must be smooth and not too thick When made

possible after preparation, but if not, it should be well beaten before being combined with the vegetable

Cream Sauce

Ingredients:
- 1 tablespoon butter or margarine
- 2 teaspoons flour
- ⅛ teaspoon salt
- Dash pepper
- ½ cup milk or milk and vegetable stock

Procedure: Melt butter or margarine in a small saucepan, stir in flour and seasonings Stir in milk gradually and continue stirring over low heat until sauce thickens and boils Yield 3 servings

Note. Add extra seasoning according to vegetable This may be minced parsley, minced chives or grated onion, finely chopped celery, grated carrot or lemon juice For dressing potatoes or macaroni, reduce flour to 1½ teaspoons

Cheese Sauce

Procedure: Follow directions for cream sauce When sauce has thickened stir in 2 tablespoons grated cheese

Chestnut Sauce

Procedure Follow directions for cream sauce When sauce has thickened add 2 tablespoons cut roasted chestnuts

Quick Hollandaise Sauce

Procedure: Follow preceding directions for cream sauce When sauce has thickened, combine 2 teaspoons lemon juice with 1 slightly beaten egg yolk and 1 tablespoon butter or margarine and stir rapidly into sauce

Hollandaise Sauce

Ingredients.
- 1 egg yolk
- 1 teaspoon lemon juice

hot, but not boiling, water, and stir vigorously until butter is melted. Add remaining butter, continue stirring until butter is melted and sauce begins to thicken Remove from heat at once Yield 2 servings

Rich Cheese Sauce

Ingredients.
- ⅛ cup processed cheese
- 2 tablespoons cream
- ⅛ teaspoon paprika

Procedure: Processed cheese comes in package form under various brand names and melts easily. Combine cheese, cream and paprika in a small saucepan, stir over very

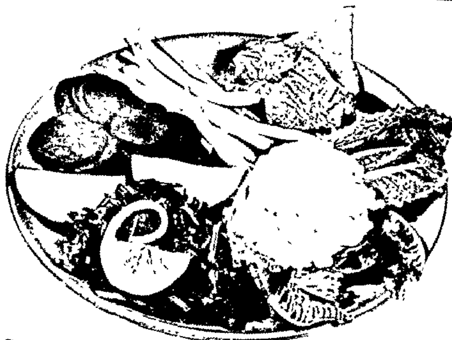


Fig 122 A vegetable plate with baked potato, hot sliced beets, beet greens garnished with lemon, carrot strips and cottage cheese.

General Directions for Frozen Vegetables

Frozen vegetables are packed in cartons, and if not to be used within 8 hours should be placed in the freezing compartment of the refrigerator, where they will remain solidly frozen. They need not be thawed before cooking If they have thawed, no attempts to refreeze them should be made. Quick-frozen vegetables may be cooked according to directions for other fresh vegetables. Place in boiling salted water, cover and continue cooking until tender. The time of cooking is generally a little shorter than that indicated for fresh green vegetables.

General Directions for Canned Vegetables

As canned vegetables are already thoroughly cooked, they need only heating and dressing to make them ready for the table The liquid from the can may be drained and boiled 2 or 3 minutes in order to evaporate some of it. The vegetables may then be heated in this liquid Canned tomatoes are of course an exception, as they are canned in their own juice.

General Directions for Dried Vegetables

Dried vegetables most commonly used are beans, peas and lentils In some localities dried mushrooms are obtainable Most dried vegetables need to be soaked before they are cooked Any exception to this rule will be noted on the package and the time for cooking given

DRESSINGS

Vegetables may be dressed with melted butter, brown butter or lemon

Spinach

Procedure: Remove roots and other leaves with sharp knife, place in pan and allow water from faucet to run over leaves. Remove leaves to another pan and repeat process until no sand accumulates in the bottom of the pan Cook in covered utensil without extra water. When tender, dress without draining or drain and reserve liquid for soup Cooked spinach may be chopped before dressing with butter or margarine, cream or French dressing or cream sauce

Note. Other greens may be prepared in

Baked Squash

Procedure. Wash, halve and seed 1 small acorn squash Brush with butter or mar-

oven (400° F) 30 minutes until tender Yield 2 servings

Baked Tomatoes

Procedure Wash 1 medium-sized tomato and cut in half Arrange halves in baking

1 serving

Broiled Tomatoes

Stewed Tomatoes

Procedure· Wash and peel 2 medium-sized tomatoes, cut in quarters and put in small saucepan Add 1 slice onion and salt, pepper and sugar to taste Cook over low heat about 10 minutes and add 1 table-

serving

STUDY QUESTIONS

1. Is the botanical classification of vegetables an indication of food value?

2 What are the most valuable contributions vegetables make to the diet? List the vegetables in order of ascorbic acid content.

3. Discuss the losses of vitamins from vegetables due to cooking

4 Compare the nutritive contributions of fresh, canned and frozen vegetables

5 What care should vegetables be given in the home kitchen? In storage? In preparation for cooking?

6 Give the general rules for cooking vegetables and the reasons for the accepted method

See Bibliography in Part Four for books on Cookery.

when there is an allergy toward fresh milk, may replace the cream. Yield: 3 servings.

MISCELLANEOUS RECIPES

Creamed Mushrooms

Ingredients:

1 cup (¼ lb) mushrooms
1 tablespoon butter or margarine
2 teaspoons flour
¼ teaspoon salt
Pepper
½ cup top milk
Onion salt to taste

Procedure: Wash mushrooms. Remove stems and slice, discarding tough ends Peel mushrooms if necessary. Young, tender mushrooms need not be peeled. Slice caps or leave whole Melt butter or margarine in

thickens and boils Add onion salt. Serve on hot toast or in croustades (p 527). Yield 1 liberal serving or 2 small servings.

Sautéed Mushrooms

Ingredients:

1 cup (¼ lb) mushrooms
1½ tablespoons butter or margarine
⅛ teaspoon salt
Pepper

Procedure: Prepare mushrooms according

on hot toast One teaspoon minced onion may be cooked with the mushrooms. Yield· 1 liberal *serving.*

Buttered Onions

Procedure: Wash and peel 4 white onions Melt 1 tablespoon butter or margarine in small heavy saucepan, add onions, cover and cook over low heat about 20 minutes (until onions are tender). No seasoning is needed; the flavor of the onions will be sweet and delicate. Yield: 1 serving

Baked Potatoes

Procedure: Wash and scrub 1 medium-sized or large potato. Grease skin lightly with butter or other fat. Bake on rack of moderately hot oven (400° F.) from 40 to 60 minutes, until potato is soft when pressed with a towel. Remove from oven, break skin open, put a pat of butter or margarine in opening, sprinkle with paprika and serve at once If there is to be a delay in serving it, wrap in cloth and keep in warm place

Baked Potatoes, Stuffed

Procedure: Bake potato according to direction in preceding recipe. Remove from oven,

and pile lightly in potato shell. Return to hot oven (450° F.) and bake about 10 minutes (until lightly browned). Yield 1 serving.

Mashed Potatoes*

Procedure: Scrub 2 medium-sized or 1 large potato Boil in salted water until tender Drain, peel and put through ricer Add 1 tablespoon butter or margarine and enough hot milk to give a creamy consistency Add salt and pepper to taste, beat until fluffy and *serve at once. Yield 1 serving.*

Stewed Potatoes

Ingredients

1 tablespoon butter or margarine
⅔ cup diced cooked potatoes
⅓ cup top milk
Salt, pepper
1 teaspoon minced parsley

Procedure. Melt butter or margarine in small heavy frying pan, add potatoes and

1 serving

* Instant mashed potatoes, prepared according to directions on package, are excellent.



Fig 123 An attractive fruit salad combination

young Swiss chard, sorrel ...

for sandwiches or used as a basis for other ingredients, they are acceptable Shredded lettuce sandwiches usually are attractive to children and invalids for luncheon.

To prepare lettuce and other greens for serving, wash the heads in several waters, pulling the leaves apart, shake off as much water as possible and place in a tightly covered container or a plastic bag, or wrap in a towel or sheet of cellophane or foil Place in refrigerator in a cold place (but above freezing temperature) and allow to crisp for at least an hour Greens will keep fresh and in good condition for a number of days under this treatment

OTHER SALAD VEGETABLES

Cabbage is a favorite ingredient for salad Also, it is often used by itself and when mixed with a cooked dressing is known as cole slaw. It may be served on bright green salad leaves or garnished

Leafy Vegetables in Salads
Other Salad Vegetables
Salad Combinations
Salad Dressings
Salads and Relishes in the Menu
Recipes

CHAPTER FORTY-SIX

Salads and Relishes

The term *salad* now covers innumerable combinations of vegetables, fruits and other food materials which are served crisp and cold with a dressing.

Salads may be divided into two classes. In the first are those which act as appetizers or savories Except for the dressing served with them, they have little fuel value but are important from the point of view of minerals and vita-

nutritive value and protein content from

the main course for luncheon, but they seldom appear on the dinner table.

pitcher and combined with the salad after the tray has been taken to the patient's room, or the dressing may be mixed with the greens just before the salad is put into the bowl.

Salads made of mixed vegetables and of fruits garnished with salad greens may be served on a salad plate

Mayonnaise should be placed on top of a mixed vegetable or a fruit salad rather than mixed with it

The term *relish* is used to describe raw vegetables such as celery, radishes, carrot strips and others which are served without a dressing They may replace the salad, or they may be served in addition with the soup or with the main course.

LEAFY VEGETABLES IN SALADS

The most popular and plentiful of the salad plants is lettuce, but there are many other delicious succulent leaves which, when they can be obtained, may be used to take its place The quality of lettuce which can be obtained all the year round in almost all sections of the country has improved enormously in the last few years, for its growing popularity has given it a greater market value Boston and iceberg lettuce, the most plentiful, are different in flavor and in texture, and equally satisfactory to serve as salads Romaine, escarole, Chinese cabbage, endive of two types and water cress are other greens which should be considered when they are in the market The leaves of raw spinach and tender

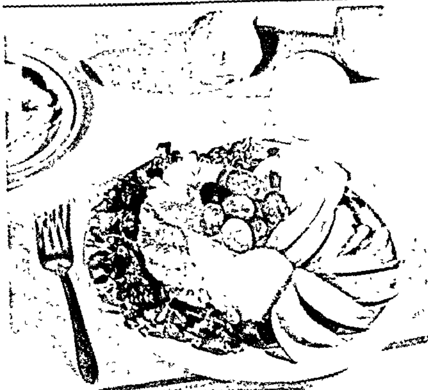


Fig 124 Fruit salad plate may be a good choice for luncheon or supper

usually liked and furnish variety and attractiveness to the patient's tray

SALAD DRESSINGS

French dressing is used more often for invalids than any other kind This is a simple combination of oil, vinegar or lemon juice and seasonings Olive oil is considered best for the preparation of dressing, but some people do not care for its flavor Salad oils made from corn, cottonseed, peanuts or soy have bland flavor and have better keeping qualities than olive oil Care must be taken to keep the oil as nearly airtight as possible and in a cool place If the bottle is clear glass, keeping it in a dark place is an added precaution against rancidity. Rancid oil served even once by mistake may cause a patient to refuse to take salad again, and thus make it more difficult to introduce the proper amounts of fruits and vegetables into the diet. After the bottle or the can has been used, the top should be wiped carefully

Oil is also an asset when a diet of high nutritive value is necessary. Mineral oil should not be used in a salad dressing, as it inhibits the absorption of the fat-soluble vitamins A, D, E and K Because it has no caloric value, it was often used in both French dressing and mayonnaise for the reducing diet. Salad dressing should be savory but not overseasoned with condiments, particularly for a patient. If vinegar is forbidden, lemon

cream dressing Minced onions or chives are generally used in combination with cucumbers. To prepare, wash before placing in refrigerator. If chilled thoroughly, it is not necessary to crisp in salted water after slicing. Cucumbers may be served pared or unpared.

Tomatoes are also used as an ingredient of a mixed salad, or they may be served in sliced form with a French dressing. Sometimes the whole tomato, from which some of the pulp has been removed, is stuffed with a mixed vegetable salad. To prepare, wash and place in the refrigerator to chill, or remove

be kept wrapped or covered in refrigerator

Carrots are a favorite ingredient of a salad Young carrots, after the removal of part of the tops, should be covered and placed in the refrigerator. They should be scraped and cut just before they are to be used.

Other Salad Ingredients. Finely cut sticks of yellow or white turnip, cauliflower, green pepper and American artichokes in raw form are sometimes used in mixed salads. Many leftover cooked vegetables such as carrots, string beans, peas or cauliflower may also be used Cooked spinach mixed with a well-seasoned French dressing may be pressed into small molds, chilled in the refrigerator and served on a bed of salad greens.

Substitutes for Salads. Raw vegetables may be served as relishes rather than in salads This may be desirable when rich food must be avoided. Tender hearts of celery, crisp radishes and carrot sticks are most commonly used. Flowerets of cauliflower, strips of turnips and young scallions may also be used if allowed.

SALAD COMBINATIONS

The simplest and best salads which will be most used in the patient's diet are the green leaves served with a dress-

type, or water cress should appear occasionally on the tray. Cabbage, if finely cut, may also be used and should find favor because it is the cheapest green vegetable during most of the year A variation in the garnish, a ring of green pepper or pimiento, a brightly colored radish or a piece of beet shaped attractively will suggest variety, even when the basis of the salad is the same.

Fruit Salads. When fruits are used for salad, care should be taken in their combination. Usually salads are more appetizing when few varieties are used in the same combination Grapefruit and white grapes with a cherry garnish, orange and date, or grapefruit and melon are more attractive both to sight and to taste than a mixture of all of them.

Heavier Salads. When the heavier salads are used as main dishes for lunch or supper, cheese and eggs are recommended. Meat or fish, mixed with mayonnaise or cooked dressing, makes a combination which may be too rich for some patients. A stuffed egg, a mold of cottage or cream cheese accompanied by a mixed vegetable salad or by the green leaves alone, is usually well liked A small amount of mayonnaise may be used as a garnish when it is allowed

Gelatin Salads Gelatin combined with tomato or fruit juices provides a means of putting extra vegetables and fruits into the diet Gelatin salads are

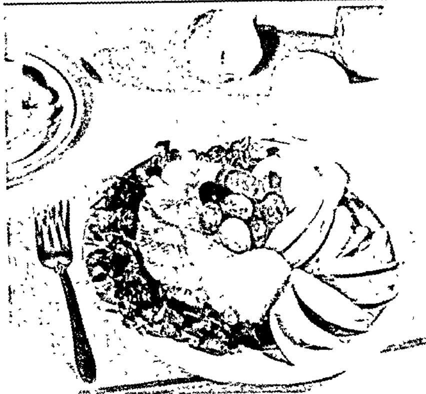


Fig 124 Fruit salad plate may be a good choice for luncheon or supper

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SALAD DRESSINGS

French dressing is used more often for invalids than any other kind. This is a simple combination of oil, vinegar or lemon juice and seasonings. Olive oil is considered best for the preparation of dressing, but some people do not care for its flavor. Salad oils made from corn, cottonseed, peanuts or soy have bland flavor and have better keeping qualities than olive oil. Care must be taken to keep the oil as nearly airtight as possible and in a cool place If the bottle is clear glass, keeping it in a dark place is an added precaution against rancidity. Rancid oil served even once by mistake may cause a patient to refuse to take salad again, and thus make it more difficult to introduce the proper amounts of fruits and vegetables into the diet After the bottle or the can has been used, the top should be wiped carefully

Oil is also an asset when a diet of high nutritive value is necessary Mineral oil should not be used in a salad dressing, as it inhibits the absorption of the fat-soluble vitamins A, D, E and K Because it has no caloric value, it was often used in both French dressing and mayonnaise for the reducing diet. Salad dressing should be savory but not overseasoned with condiments, particularly for a patient. If vinegar is forbidden, lemon

juice may be substituted for it in most dressings. If oil is forbidden or not liked, lemon juice by itself or mixed with orange juice will give a desirable flavor.

Mayonnaise, an emulsion of oil, egg yolks and acid, should usually be thinned with lemon juice rather than with vinegar A little catsup or chili sauce added to mayonnaise may be used instead of other seasoning as a variation. It gives color as well as savor to the salad.

Sour-Cream Dressing. There is no *dressing more useful than sour-cream* dressing. Commercial sour cream sometimes labeled "salad cream," should be purchased as such, as unfavorable bacteria instead of the lactic acid type may develop in pasteurized cream kept under home conditions. Whipped sweet cream may replace sour cream if an extra amount of vinegar is added to the recipe (*see* p. 514).

Cooked Dressing. A cooked dress- [illegible]

for use with fruit.

SALADS AND RELISHES IN THE MENU

Through the use of salads and relishes, both the nutritive quality and the attractiveness of the meal can be im- [illegible]

they contribute practically all their natu- [illegible]

[illegible]

greens there can *always be variety in* both flavor and appearance If the patient prefers a mixed green salad and welcomes its appearance daily, there is no reason why it should not be served. Different dressings may be served, or the standard French dressing may appear daily, *according to the taste of the* patient.

[illegible]

2. They should be attractive to the eye.

3. They should be simple rather than elaborate.

4. They should have a dressing which *is well but moderately seasoned.*

5 They should be varied either as to combination or to dressing from day to day.

Preparation of Relishes

Celery, radishes and carrot strips are the relishes most used. Scallions, flowerets of raw cauliflower, strips of young turnip and green pepper and thin wedges of cucumber may also be used [illegible]

flavored cottage or cream cheese or with a blend of a highly flavored cheese with cream or cottage cheese.

All vegetables should be washed carefully and trimmed. Carrots should be scraped before being sliced into thin strips. Although it is customary to soak these vegetables for half an hour or more in salted water, some of the nutrients may be lost. This will also be the case when they are allowed to stand *after they have been prepared* Vegetables to be served as relishes should preferably be prepared just before they [illegible]

relishes are more appetizing when chilled, there may be a good reason for preparing them an hour or two before serving. A salt shaker on the invalid's tray should accompany relishes.

RECIPES FOR SALADS

Vegetable Salads

Mixed Green Salad

Procedure: Crisp lettuce, romaine or other salad greens may be combined with any raw vegetable such as sliced cucumbers, radishes, sliced onions, shredded carrots, cabbage, green pepper or sliced skinned tomatoes The ingredients must all be crisp and cold and tossed with French dressing just before they are served. For preparation of cucumbers and tomatoes see cucumber salad and tomato salad on this page

Mixed Vegetable Salad

Procedure: Cooked vegetables such as diced beets, peas, Lima beans and shredded string beans may be combined with a small amount of shredded raw carrots or diced celery and well-seasoned French dressing Minced onions or chives may be added if desired Serve in lettuce cup with mayonnaise on the side Allow ½ cup mixed vegetables for 1 serving

Potato Salad

Procedure: Mix ½ cup cold diced potatoes with ¼ cup diced celery, 1 teaspoon minced onion and 1 tablespoon French dressing Just before serving add 1 tablespoon mayonnaise or cooked salad dressing Serve on lettuce and garnish with minced parsley or green pepper Yield 1 serving

Tomato Salad

Procedure Scald tomato 1 minute in boiling water Drench with cold water and drain Peel and slice or cut into eighths, dress with French dressing. Add sliced onion, diced celery or sliced cucumber if desired. Serve on bed of lettuce with mayonnaise on the side Yield 1 serving

Small skinned tomatoes may be cut in quarters and almost to stem end and arranged on lettuce The tomato cup may be filled with mixed vegetable, chicken or fish salad.

A slice may be removed from the stem end and the center pulp removed, in which case fill center with any fish, meat or vegetable salad Serve on lettuce and garnish with mayonnaise.

Asparagus Salad

Procedure· Arrange drained and chilled cooked or canned asparagus on bed of lettuce or romaine Sprinkle with French dressing and garnish with strips of pimiento Grated cheese may be sprinkled over the asparagus if desired Allow from 4 to 6 asparagus stalks for 1 serving

Cabbage Salad

Procedure. Mix shredded cabbage with French dressing, cooked salad dressing, sour-cream dressing or mayonnaise Add minced onion, green pepper or pimiento to the salad or use as a garnish Serve in lettuce cup or on other salad greens. Allow 1 cup shredded cabbage for 1 serving

Cucumber Salad

Procedure Wash and chill cucumbers Pare and slice If cucumbers have not been chilled, they may be placed in salted ice water for about 15 minutes after being sliced, and then drained. Dress with French dressing or sour-cream dressing, add minced onions, scallions or chives if desired Allow ½ cucumber for 1 serving

Jellied Vegetable Salad

Ingredients

- 1 teaspoon granulated gelatin
- 1 tablespoon cold water
- ½ cup boiling water
- 2 teaspoons sugar
- ⅛ teaspoon salt
- 1 tablespoon lemon juice or mild vinegar
- ¼ cup finely diced celery
- 2 teaspoons chopped green pepper

[illegible]

small molds Chill until set. Unmold on salad plate and garnish with lettuce or other salad greens Serve mayonnaise on the side Yield 2 servings

NOTE Shredded cabbage may replace part or all of the celery.

Cheese and Egg Salads

Cottage Cheese Salad

Procedure: Mix ½ cup cottage cheese with 1 teaspoon minced onion or chives and 1

teaspoon minced parsley. If dry cheese is used, moisten with cream. Pack in a small buttered custard cup and chill for half an hour Unmold and serve with water cress or shredded lettuce. Serve with French dressing. Yield 1 serving

Cream Cheese Salad

Procedure: Soften cream cheese with fork. Add a small amount of cream if necessary. Form cheese into balls and roll in minced parsley or paprika. Serve on bed of water cress and sprinkle with French dressing. The cheese may be flavored with minced chives or minced onion if desired. Allow from 1 to 2 ozs cheese for 1 serving.

Stuffed Egg Salad

Procedure. Follow directions for stuffed eggs (p 451). Serve on lettuce and garnish with mayonnaise

Fruit Salads

Apple and Celery Salad

Procedure. Pare, core and dice ½ medium-sized apple, combine with an equal amount of diced celery and enough mayonnaise to moisten Serve in a lettuce cup and garnish with mayonnaise and with 2 or 3 pecans or walnut halves. Yield. 1 serving

Fresh Fruit Plate

Procedure· Arrange alternately berries in season, sliced pineapple, sliced melon or sections of grapefruit or orange round edge of plate and sprinkle with French dressing In the center place lettuce cup containing mayonnaise Cream cheese balls may be used as a garnish. Serve as main luncheon dish.

Grapefruit and Orange Salad

Procedure: Arrange alternate sections of grapefruit and orange on leaf of lettuce or romaine Sprinkle with French dressing and garnish with sliced ripe olives or green pepper. Allow 3 sections each of grapefruit and orange for 1 serving Sliced pared avocado may replace the orange or the grapefruit

Melon Salad

Procedure: Cut peeled cantaloupe, honeydew or watermelon into balls or cubes One [illegible] 8 to 10 balls for 1 serving.

Jellied Fruit Salad

Procedure: Follow directions for jellied [illegible]

Mixed Fruit Salad

Procedure: Almost any combination of mixed fresh or canned fruits may be used [illegible] used as ingredients for fruit salads. Generally, not more than 3 or 4 fruits are combined. The fruit should be chilled and combined just before it is to be served. Arrange fruit on lettuce, sprinkle with French dressing and garnish with mayonnaise or cooked fruit salad dressing. Allow about ¾ cup mixed fruit for 1 serving

Meat and Fish Salads

Chicken Salad

Procedure: Combine ½ cup diced cooked chicken with an equal amount of diced [illegible] olives or with sliced hard-cooked egg [illegible] over cooked pork or veal may replace the chicken Yield. 1 serving

Crabmeat Salad

Procedure: Follow preceding directions for chicken salad, substituting flaked fresh or canned crabmeat for chicken A teaspoon minced onion may be added if desired.

Shrimp Salad

Procedure. Cooked, fresh or canned shrimps may be used Remove black vein Arrange on lettuce, sprinkle with French dressing and serve Russian dressing on the side Allow from 4 to 6 shrimps for 1 serving.

RECIPES FOR SALAD DRESSINGS

Recipes are given in family quantities as they can be stored in refrigerator. They may be halved if desired

Cooked Salad Dressings

Cooked Fruit Salad Dressing

Ingredients
- 2 egg yolks
- ¼ cup sugar
- ½ cup orange juice

Cooked Salad Dressing

Ingredients
- 2 teaspoons salt
- 1 teaspoon dry mustard
- 4 teaspoons sugar
- Dash cayenne
- 2 tablespoons flour
- 2 eggs or 4 egg yolks, slightly beaten
- 1 cup scalded milk
- ½ cup vinegar

Procedure: Mix dry ingredients in small saucepan or in top of double boiler Add slightly beaten eggs or yolks, stir in milk and vinegar Stir over low heat or over hot water until mixture thickens Chill and, when ready to serve, thin with sour cream Store in covered jar in refrigerator Yield About 1¼ cups

French Dressings

Basic French Dressing

Ingredients·
- ½ teaspoon salt
- ⅛ teaspoon pepper
- ½ teaspoon sugar
- ½ teaspoon dry mustard
- ½ teaspoon paprika
- ½ cup salad oil
- 2 tablespoons mild vinegar

allowed Yield. ½ cup

Chiffonade Dressing

Procedure. Add 1 teaspoon each minced

Fruit French Dressing

Ingredients.
- ¼ teaspoon salt
- ⅛ teaspoon paprika
- ⅛ teaspoon sugar
- ¼ cup salad oil
- 2 tablespoons orange juice

just before serving Yield About ½ cup.

Roquefort Dressing

Procedure: Add crumbled Roquefort cheese to French dressing

Mayonnaise

Mayonnaise

Ingredients
- ½ teaspoon dry mustard
- 1 teaspoon salt
- ½ teaspoon sugar
- 1 egg yolk
- 2 tablespoons lemon juice or vinegar
- 1 cup salad oil

Procedure Mix mustard, salt and sugar, add egg yolk and mix well Stir in 1 teaspoon lemon juice or vinegar, add oil gradually drop by drop at first while beating with

mately 1½ cups

NOTE Commercial mayonnaise may be varied by the addition of lemon juice, or vinegar and savory seasonings

Russian Dressing

Procedure. Combine mayonnaise with an equal amount of chili sauce. Minced

chopped onion and minced chopped green pepper may be added.

Other Dressings

Bacon Dressing

Ingredients:
- 1 strip bacon
- 1 teaspoon sugar
- 2 tablespoons vinegar

Procedure: Cut bacon in 1-inch squares [illegible] lettuce, shredded cabbage, young spinach leaves or other salad green Yield· 1 serving.

Sour-Cream Dressing

Ingredients:
- 1 teaspoon salt
- ¼ teaspoon paprika
- ½ cup sour cream
- Vinegar to taste

Procedure: Mix seasonings, add cream and beat well. Add vinegar. Whipped sweet cream may be used if extra vinegar is added. One teaspoon minced onion or chives may be added. Yield· About ½ cup

STUDY QUESTIONS

1. Salads as now served may be divided into 2 classes. What are these classes?
2. Probably the most popular and the most plentiful salad plant is lettuce Name some other salad plants
3. It has been the custom to discard the outer green leaves of salad plants. Why should these leaves be used?
4. When fruits are used for salad, care should be taken in their combination. Why?
5. Plan a luncheon featuring an appropriate salad as a main dish.
6. Plan a luncheon or a supper using an appropriate salad as an accessory to a main dish.

See Bibliography in Part Four for books on Cookery.

Ready-To-Use Soups
Clear Soups
Unthickened Milk Soups
Cream Soups

CHAPTER FORTY-SEVEN

Soups

Soup, which in the normal diet is often considered an accessory to the meal, may have a more important place in the diet of the ill and the convalescent A liquid diet will be ordered by the physician for a short or a long period when a patient is unable to handle solid food, or when appetite for any type of food may be completely lacking and the patient may be more easily persuaded to take nutritious food in liquid form A soup made with milk may carry a worth-while amount of important nutrients A hot clear soup, while contributing little nutritively, is sometimes "comforting to the stomach" and may serve to stimulate digestive secretion and thereby create a desire for other food For this reason, a clear soup makes a good beginning for lunch or dinner, even after the patient has begun to take food in meal form In cases where a high caloric diet is part of the treatment, a cream soup, or at least one made with milk, may be preferred at the beginning of the meal

READY-TO-USE SOUPS

The nurse, who will have many duties to perform for her patient besides that of preparing an appetizing tray for each meal, will often take advantage of the variety of canned and frozen soups of excellent quality and flavor which are now available The bouillon cubes and powders with a meatlike flavor and the condensed meat extract may also be useful on occasions when a quickly prepared hot liquid is desirable Higher in food value are the dehydrated vegetable soups, which may have a place on the menu when the patient has returned to normal diet.

Both canned and dehydrated vegetable soups may be diluted with milk, both to increase food value and to improve flavor In the beginning of convalescence, a comparatively large amount of milk should be used when the patient does not care for the normal amount of seasoning Cream may be used for dilution if it is desirable to increase the calories. Tomato juice, hot or cold, with or without extra seasoning, can serve as a quick and easy soup A combination of tomato and clam juice may be purchased already mixed, or the products may be bought separately and combined. Chicken consommé may also be combined with either of the above-mentioned products.

CLEAR SOUPS

Clear soups are prepared from both meat and poultry. Directions and recipes for these will be found in Chapter

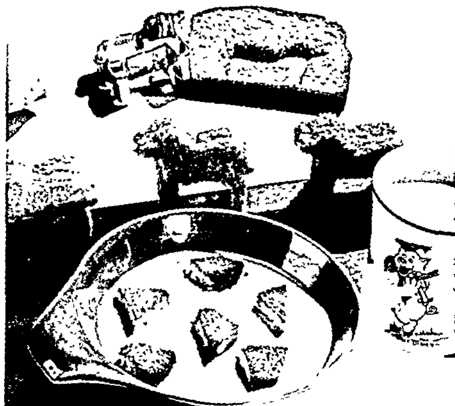


Fig. 125. An attractive tray for the sick child—soup and sandwiches cut in animal shapes.

43. Meats. Clams furnish the one fish product used for broth which may also be called a clear soup. A combination of chicken stock and clam broth is particularly good.

Clam Broth

Ingredients:
- 6-10 clams in shell
- 1 cup water
- Dash salt
- Paprika

Procedure: Choose chowder clams, if possi- [illegible]

[illegible] opened. The clams may be served at once in the shell or in any other way. Allow broth to settle, strain, reheat, add salt and paprika to taste, and serve hot. Yield: 1 serving.

Clam broth may be served hot or cold with 1 heaping teaspoon whipped cream into which a little salt and paprika have been beaten

Consommé Bellevue

Ingredients:
- [illegible] cup chicken stock

[illegible]

cream. Yield: 1 serving.

UNTHICKENED MILK SOUPS CHOWDERS AND STEWS

Basic Recipe for Soups with a Milk Base. Soups with a milk base

are used largely in the patient's diet. Among these an oyster stew is popular. Well-seasoned, finely cut or puréed cooked vegetables may be combined with milk and cream, with milk and chicken or other white stock, without the addition of any thickening. When several vegetables are used, or when fish and vegetables are combined, soups of this type are known as chowders. Unthickened soups may be useful when there is an allergy to wheat.

Celery Soup

Ingredients.
- ½ cup diced celery
- 2 slices onion
- ½ cup water
- ¼ teaspoon salt
- ½ cup top milk
- Dash pepper
- 1 tablespoon minced parsley

Procedure: Combine celery, onion, water and salt, cover and cook over low heat until celery is tender (about 5 minutes). Heat milk and bring almost to boiling. Combine with celery-onion mixture. Add more seasoning if necessary and serve garnished with minced parsley. Yield 1 serving

Potato Soup

Ingredients:
- 1 medium-sized potato
- 2 slices onion
- ¼ teaspoon salt
- ½ cup milk
- 1 tablespoon butter
- 1 tablespoon minced parsley
- Dash pepper

Procedure: Pare and dice potato, add enough water to cover, then onion and salt. Cover and cook until potato is tender. Strain and force through a sieve. Heat milk, combine with potato and stir over low heat until very hot. Add butter, parsley and pepper, beat well. Add more salt if necessary. Yield 1 serving

Note: Instant mashed potatoes may be used, according to directions on package.

Vegetable Chowder with Milk

Ingredients:
- 1 tablespoon butter
- ½ cup diced vegetables (potato, celery, carrots, peas)
- 2 slices onion
- ½ cup water
- ½ cup milk
- Salt
- Pepper

Procedure: Melt butter, add vegetables, cook 2 minutes, stirring constantly. Add water, cover and cook about 10 minutes (until vegetables are tender). Add milk, season to taste with salt and pepper and reheat. Yield 2 servings

Oyster Stew

Ingredients
- 4-6 oysters
- 1 tablespoon butter
- 1 cup milk
- ¼ teaspoon salt
- Dash pepper
- Dash paprika

Procedure: Look over oysters to remove any pieces of shell which may be present. Melt butter, add drained oysters and cook 2 minutes until edges curl. Add remaining ingredients and cook over low heat until milk is thoroughly heated. Stir occasionally during cooking. Yield 1 serving

CREAM SOUPS

A combination of thin cream sauce with a purée of vegetable or fish, or with a rich stock which is usually chicken or veal, is known as a cream soup or a bisque. If a soup of this type is not thickened, it may "separate," leaving melted fat on the top, which is unattractive. Cream sauce is used to "bind" the materials and to make a smooth, creamy soup. A general rule is to use one half as much vegetable or fish pulp as cream sauce. As it is impossible to make cream sauce in a very small quantity, each of the recipes which follow will furnish 1 generous serving which may be used to provide a goodly part of the meal, or 2 servings when soup is to be served as a first course.

Often the choice of cream soups will be made when leftover cooked vegetables are on hand. As they will need further cooking to make them soft enough to go through a sieve, the direc-

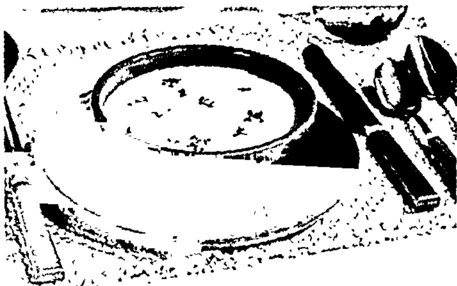


Fig. 126. A milk vegetable soup with parsley garnish.

tions which follow for the preparation of vegetable purée may be used for both raw and cooked vegetables. Puréed vegetables may be purchased in canned form. While both vegetables and the [illegible]

should be added [illegible] consistency of the soup is thicker than cream, a little more milk should be added and the soup reheated. For high caloric soup, one half the milk in the recipe for basic cream sauce may be replaced by cream, or extra butter may be added just before serving. With highly flavored vegetables, undiluted evaporated milk or a double amount of powdered milk when reconstituted with water may be used to increase both caloric and protein content.

Purées. Cream soups are sometimes called purées. The fish or vegetables used in their preparation are forced through a very fine sieve in order to produce a particularly smooth soup.

Bisques. The term bisque is generally used for cream soup made from shellfish, or it is sometimes applied to a vegetable cream soup. Sometimes the shellfish are chopped rather than pressed through a purée sieve.

Basic Cream Sauce for Soup

Ingredients:
- 1 tablespoon butter
- 2 teaspoons flour
- ⅛ teaspoon salt
- Dash pepper
- ½ cup milk

Procedure: Melt butter in small saucepan, stir in flour and seasonings. Stir in milk gradually and continue stirring over low heat until sauce thickens and boils. If there is an allergy to wheat, 1 teaspoon cornstarch may replace 2 teaspoons flour. Yield Approximately ½ cup sauce.

Fresh Vegetable *Purée* for Cream Soups

Procedure: Allow ½ cup finely diced vegetables, such as celery, carrots or asparagus, ⅜ cup diced beets, potatoes, onions, or cut or canned corn, 1 cup fresh or canned peas, 1½ cups spinach or lettuce leaves to flavor 1 portion of cream soup. Place vegetables in small saucepan, add ¼ cup water, ⅛ teaspoon salt and a dash sugar. Add 1 or 2

slices onion if allowed Cover and cook over low heat until vegetables are tender and force through sieve or ricer.

Canned Vegetable Purée

Procedure: Drain vegetable, combine ½ cup diced vegetable with ⅛ cup liquid from can Follow preceding directions or use canned strained vegetables (baby food)

General Recipe for Cream Soup

Ingredients:

½ cup vegetable purée
½ cup basic cream sauce
Seasonings

Procedure Prepare purée Make cream sauce, add purée and beat well. Add more salt and pepper to taste and other seasonings. Add according to suggestions given below and reheat Cream soups may be garnished with 1 tablespoon whipped cream sprinkled with paprika Yield 1 serving

Cream of Asparagus Soup

Procedure: Follow general recipe for cream soup Add a few drops lemon juice and garnish with cooked asparagus tips

Cream of Celery Soup

Procedure Follow general recipe for cream soup If desired, the celery may be finely chopped instead of being forced through a sieve Garnish with minced parsley, water cress, chives or grated raw carrot



Fig. 127. Cream soup with star-shaped croutons.

Cream of Corn Soup

Procedure: Follow general recipe for cream soup. Use fresh grated corn or canned corn, cream style

To make purée: use milk instead of water and cook 10 *minutes in the top of a double boiler. The purée may be* unstrained if it is so desired. Garnish with strips of pimiento.

Cream of Mushroom Soup

Ingredients:
- ½ cup sliced mushrooms
- ½ cup water
- 2 tablespoons butter
- 2 teaspoons flour
- ¼ teaspoon salt
- Dash pepper
- ½ cup milk

Procedure· Wash and stem mushrooms. *Simmer stems in water until tender.* Cut [illegible] milk slowly, stirring constantly over low heat until soup thickens and boils Add mushrooms and more salt if desired. If desired, a teaspoon minced onion may be cooked in the butter with the mushrooms. Yield 1 serving.

Cream of Onion Soup

Procedure: Follow general recipe for cream soup Garnish with minced parsley, grated cheese or minced roasted chestnuts.

Cream of Pea Soup

Procedure. Follow general recipe for cream soup Add sugar and nutmeg to taste and garnish with paprika or minced cooked bacon

Cream of Potato Soup

Procedure: Follow general recipe for cream soup. Garnish with minced parsley, chives or water cress

Cream of Spinach Soup

Procedure: Follow general recipe for cream soup Add sugar, nutmeg and *a few drops* lemon juice.

Cream of Tomato Soup

Ingredients:
- ½ cup canned tomatoes
- ½ bay leaf
- 2 cloves
- *¼ teaspoon sugar*
- *¼ teaspoon celery* salt
- 1 sliced onion
- Speck baking soda
- Dash pepper
- Basic cream sauce (p. 518)

Procedure· Combine tomatoes, bay leaf, spices, seasonings and onion. Bring to boiling point and cook 5 minutes over low heat. Add baking soda and strain into cream sauce. Mix thoroughly and add more salt and pepper to taste. Reheat and garnish with whipped cream Yield 1 serving

Oyster Bisque

Ingredients:
- 6 oysters
- ½ cup milk
- ½ slice onion
- 1 sprig parsley
- 1 tablespoon butter
- 2 teaspoons flour
- ¼ teaspoon salt
- Pepper

Procedure: Pick over oysters, drain and chop. Combine chopped oysters and drained liquor, and bring to boiling. Press oysters and liquor through a sieve Scald milk with onion and parsley and strain Melt butter, stir in flour, salt and pepper, and when well blended add strained milk slowly, stirring constantly over low heat until mixture thickens and boils. Add oysters and more salt if necessary. Reheat and garnish with minced parsley or paprika Yield. 1 serving.

Clam Bisque

Procedure: Follow preceding directions for oyster bisque, substituting clams for oysters

STUDY QUESTIONS

1. Why may soup have an important place in the diet of the convalescent? *Compare the contributions* of a clear and a milk soup.

2. Distinguish between milk soups, chowders and stews

3. *Define a cream soup.* What other terms are also used to describe cream soups?

4 Plan a luncheon or a supper using a clear soup and other dishes appropriate for serving with this type of soup

5 Plan a luncheon or a supper which includes a cream soup

See Bibliography in Part Four for books on Cookery.

Grain for Bread
Commercial Versus Homemade Yeast Breads
Yeast-Bread Standards
Yeast in Bread-Making
Quick Breads
Recipes

CHAPTER FORTY-EIGHT

Breads, Batters and Doughs

Primitive man, perhaps in a lean season when animal food was scarce, added to the wild fruits which were his first source of vegetable food the wild grains that grew on the plain. Soon a primitive mill, made from two stones, ground them. They were then mixed with water and baked between the hot stones which he had learned to use as an oven after the discovery of the use of fire for cooking.

The first use of yeast as a leavening [illegible] of much importance in the story [illegible]

[illegible] oped a fine bread, and according to history the Roman bakeries of later date were owned by Greeks

The Romans introduced grains ap- [illegible] of bread-making. Later, when all the arts, including cookery, lapsed, yeast bread remained a staple food. Much of it was very coarse, and even the lord and the lady of the manor had white bread only on special occasions

After the Renaissance, better grains and methods of milling were introduced. Yeast was the only leavening known until comparatively modern times. The "quick" breads, often known as "hot" breads, are seldom used to any extent in any country except the United States Corn, or maize, was the only grain indigenous to this country, and it was prepared at first by mixing with water and baking in primitive fashion. Eventually, a form of leavening known as pearl-ash, a by-product of wood ashes, came into use. This was followed by commercial baking soda or saleratus, and later by baking powder. It was not until after the invention of the kitchen range a century or so ago that quick breads, in the modern sense, became a factor in the menu.

Although bread is not quite so important a feature of the diet at the present time, when such a variety of foods is available, it remains a staple and is served in some form in most households

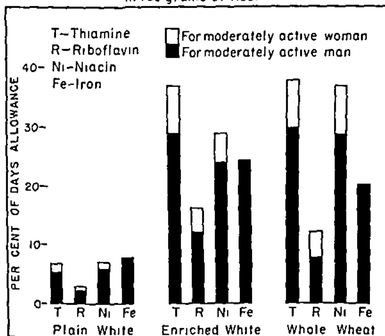


Figure 128

at all three meals of the day. The yeast loaf is the standard choice

GRAIN FOR BREAD

Various types of ground grain, called flour, are used for bread The experience of the ages has taught that wheat furnishes the most satisfactory flour for fine-quality bread In the United States it is the only grain used to any great extent Because of the large amount of gluten which wheat contains and which "develops" through kneading, wheat is ideal for a yeast bread It is equally good for the baking-powder breads which are not kneaded. For these reasons wheat is considered the most important of the bread cereals in this country In some European countries rye and barley are used largely. Rice is not used in bread-making, although it is used to larger extent than any other grain in the world, as half the world's population use rice as their staple food

Whole and Milled Grains In preparing cereals for bread-making the primitive machinery of our early ancestors merely crushed the grain. Later, the coarsest of the bran was removed.



Fig. 129. Loaves of bread showing effect of milk on texture and appearance. Loaf 1 was made with water, Loaf 2 with whole skimmed milk, Loaf 3 with powdered milk. Note the improvement in the general appearance of the whole loaf and the better texture in 2 and 3. This is due to the use of milk. Milk has the further advantage of increasing the nutritive value of the bread. (University of Illinois)

The modern roller-milling of wheat is a more complicated process, particularly designed to produce a pure white flour. Such flour contains none of the bran or germ and represents 70 per cent or less of the wheat kernel. The germ and the

as whole-grain flour or manufactured into whole-grain or "bran" cereals. The taste, the appearance and the keeping quality of white flour and products made from it are largely responsible for the predominating use of this type of flour in this country.

In an effort to improve the nutritive value of the white loaf, which has become the bread of choice, a program for restoring flour and bread to nearly whole-grain value was initiated during World War II through the concerted efforts of nutritionists and the milling industry. Bread flour and all-purpose flour were enriched according to Federal specifications Legislation was passed which made it obligatory for all bread made by commercial bakeries to be enriched for the duration of the war In the following years, legislation has made enrichment mandatory in more than half of our states. In addition, a corn- and rice-enrichment program has been initiated in the Southern states (*see* Chap. 2).

Commercial bread may be enriched by the addition of minerals and vitamins or by the use of enriched flour A study of the chart "Comparison of

White Enriched and Whole-Wheat Flour" shows the great improvement in nutritive value accomplished by the addition of thiamine, riboflavin, niacin and iron to white flour This enrichment puts it about on a par so far as these factors are concerned with whole-wheat flour.

Several large baking companies are now offering loaves with higher protein, mineral and vitamin content as indicated on the labels

YEAST-BREAD STANDARDS

The United States Department of Agriculture has devised certain standards to which not only the homemade loaf but also the commercial product should conform in most respects Because of the present custom of wrapping bakery bread, the crust is softer than that of a homemade or an unwrapped loaf. There has been a trend toward a softer crumb than that supplied by a homemade loaf. French and Italian bread, and other typical foreign breads which have a crisp crust, are not wrapped. As these breads generally are made with water rather than with milk, and as no shortening is used, the nutritive contribution may be less than that of the standard loaf Further, they become stale more quickly. However, they are chosen by some because of their special flavor and crisp crust. Special types of loaves made with eggs, extra shortening and sometimes sweetened with honey, have been offered to meet the demand for what is considered a homemade type of loaf. They are sold at a higher price and have a limited but growing distribution Many of the large commercial bakers offer loaves of rye, gluten, whole wheat and sometimes [illegible]

YEAST IN BREAD-MAKING

Compressed yeast, which customarily was used for bread made in home kitchens, has been generally superseded by dry, granular yeast. This is [illegible]

purchase The type of granular yeast now on the market has a quicker action than that formerly offered, and results are as good as when the compressed product was used In whatever form yeast is used, it contains millions of living organisms which reproduce rapidly when given food in the form of sugar (or starch, which is convertible into sugar), a suitable temperature and moisture The generally available yeasts on the market are pure and begin to act when provided with the above necessities Much more consistent results are obtainable when the present standardized yeasts are used than when our grandmothers made yeast at home by allowing the wild yeast plants to ferment potato water or flour and water.

RECIPES USING YEAST BREAD AS A FOUNDATION

Sliced bread is often used for toast and may be thick or thin according to preference For Melba toast, thinly sliced bread must be used. For croutons, either thick or thin bread may be used. For sandwiches of the luncheon or picnic type, thick slices are usually preferred, while for tea sandwiches the thinner slices are desirable. Bread crumbs, both soft and dry, are used as a topping or a coating for other foods. They are also used to make a stuffing for fowl and other meats

TOAST RECIPES

Toast

Procedure: The crusts may be trimmed if desired before toasting in the broiling oven



Fig 129. Loaves of bread showing effect of milk on texture and appearance Loaf 1 was made with water, Loaf 2 with whole skimmed milk, Loaf 3 with powdered milk. Note the improvement in the general appearance of the whole loaf and the better texture in 2 and 3. This is due to the use of milk. Milk has the further advantage of increasing the nutritive value of the bread. (University of Illinois)

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as whole-grain flour or manufactured into whole-grain or "bran" cereals. The taste, the appearance and the keeping quality of white flour and products made from it are largely responsible for the predominating use of this type of flour in this country.

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Commercial bread may be enriched by the addition of minerals and vitamins or by the use of enriched flour. A study of the chart "Comparison of

Cheese Toast

Procedure Follow preceding directions for cream toast After sauce has thickened, add ½ cup grated cheese, stir until melted and pour over toast.

Cream Tomato Toast

Procedure. Follow directions for Cream Toast, substituting ½ cup tomato juice or ½ cup condensed tomato soup for ½ cup milk

Cinnamon Toast

Procedure: Sprinkle hot buttered toast with mixed sugar and cinnamon Allow ½ teaspoon cinnamon and 1 tablespoon sugar for each slice of toast

Special Cinnamon Toast

Ingredients
- 2 slices bread
- 1 tablespoon butter
- 2 tablespoons sugar
- ½ teaspoon cinnamon

Procedure. Trim crust from sliced bread, cream butter, sugar and cinnamon Spread on bread and cut in finger lengths Bake in moderate oven (350° F) *from 10 to 12 minutes* (until slightly brown). Yield. 1 serving

Croutons

Procedure: Remove crusts evenly with a long, sharp knife from sliced bread, reserve crusts for dry crumbs. Cut bread into cubes or fancy shapes and bake in a moderate oven (325° F.) *or brown lightly in butter* in a small frying pan Stir occasionally with either method.

Croustades

Procedure Cut a slice of bread 2 x 3 inches from loaf Trim crust evenly and remove enough crumb from center to form a box Brush with melted butter and bake in moderately hot oven (400° F) until brown and crisp

Toast Water

Ingredients:
- 3 slices Melba toast
- 1 cup boiling water
- Salt

Procedure Break toast into small pieces and pour boiling water over it. *Let stand* for 1 hour, strain, add salt and serve hot or cold If desired, a teaspoon of wine or *cream and sugar to taste may be added* Toast water is usually given, however, to postoperative or very sick patients who can take only the slightest amount of nutriment, and it is therefore usually served plain Yield. 1 serving

Toasted crackers may be used in place of Melba toast

PREPARATION OF CRUMBS

Fine Dry Crumbs

Procedure. Dry crusts or bread slices in slow oven until crisp enough to roll Place on towel, fold over and crush with rolling pin

Soft Crumbs

Procedure Use bread 1 day old or more, but not dried out Rub slices together or grate, discarding crusts Three slices of bread ½ inch thick will make about 1 cup crumbs

SANDWICHES

General Directions

When a sandwich is to serve as the main luncheon dish, sliced bread or bread cut ½ inch thick may be used For dainty sandwiches to serve with salads or with tea, thinly sliced bread should be used. Canapés, which are merely open sandwiches, usually garnished *attractively, may replace the thin filled* sandwiches If loaf bread is used, a long thin knife, preferably with a saw edge, should be chosen and kept absolutely vertical while the loaf is cut, in order that slices may be of even thickness. Bread a day old will slice more easily than fresh bread Unless sandwiches are to be toasted, *the bread* should not be purchased more than a day ahead Butter should be allowed to soften at room temperature, but should not be melted. If not quite soft enough to spread, it may be worked with a stiff knife with a rounded end until the desired consistency is reached

The crusts are often removed from the bread for luncheon, supper and tea

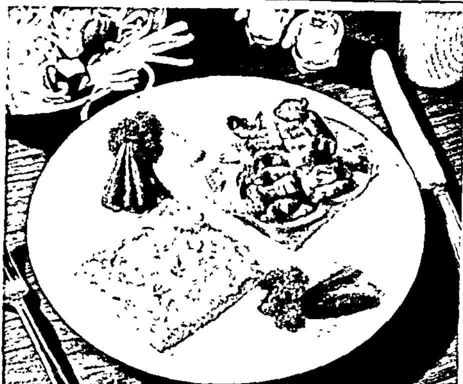


Fig 130. Open-face sandwiches, cottage cheese, bacon and tomato.

of the gas or the electric stove, or in the electric toaster. The latter may be used in [illegible]

tered as soon as it is made. Buttered toast should never be put under the heat of the broiler. If it cannot be served immediately, it may be kept warm by the retained heat of the broiling oven after the heat has been turned off. Toast made in the kitchen should be wrapped in a napkin to keep it as hot as possible.

Melba toast is made from thinly sliced bread and should be baked in a very slow oven (250° F) until golden brown. It may be served hot or cold, and is often ordered for the invalid diet.

Milk Toast

Ingredients:
- 1 cup milk
- Salt to taste
- 2 slices buttered toast

Procedure. Heat milk in double boiler, add salt Serve in heated pitcher with toast arranged in a hot cereal bowl Pour milk over 1 slice of toast at a time when serving Cream may be substituted for half the milk.

Yield. 1 serving

Cream Toast

Ingredients:
- 1 tablespoon butter
- 1 tablespoon flour
- ⅛ teaspoon salt
- 1 cup milk
- 2 slices buttered toast

Procedure: Melt butter in a small saucepan, stir in flour and salt, stir in milk gradually and continue stirring over low heat until sauce thickens and boils. Pour at once over buttered toast Garnish with minced parsley or paprika

Yield. 1 serving

Cheese Toast

Procedure. Follow preceding directions for cream toast After sauce has thickened, add ½ cup grated cheese, stir until melted and pour over toast.

Cream Tomato Toast

Procedure. Follow directions for Cream Toast, substituting ½ cup tomato juice or ½ cup condensed tomato soup for ½ cup milk

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The crusts are often removed from the bread for luncheon, supper and tea

sandwiches. This should be done evenly with a *comparatively long sharp knife*, and it is easier to do after the sandwiches are filled. For this reason, filling should not go completely to the edge, this avoids waste. Bread is often toasted, sometimes on both sides and sometimes on one side, for luncheon or supper sandwiches before they are filled. Dainty sandwiches may be toasted after filling.

When chicken, fish, cheese or peanut butter is used as the main ingredient of the filling, sandwiches may sometimes serve as meat alternates, and even the dainty sandwiches may be counted upon to add somewhat to the protein content of the diet. When salad greens are included with the sandwich filling, they should be crisp. If shredded, they are easier to eat. Luncheon or supper sandwiches should be cut into strips, either lengthwise or diagonally, unless they are to be served "open face," when *they will be eaten with a fork* For these, spreads contrasting in flavor and in color may be used. Well-seasoned cottage cheese, for instance, may be spread on one slice of bread or toast, while bacon and tomatoes may be used on the other.

LUNCHEON OR SUPPER SANDWICHES

Chicken or Turkey Sandwiches

Method 1: Thinly sliced chicken or turkey between slices of buttered bread is often preferred to a chopped filling for a luncheon or a supper sandwich. This may be seasoned merely with salt and pepper. Crisp lettuce may be placed on top of the meat and spread with mayonnaise.

Method 2 Chopped chicken or turkey may be mixed with mayonnaise and seasoned with a small amount of onion if allowed and liked For a salad sandwich, the meat *should be chopped* coarsely and combined with celery as well as mayonnaise For a minced chicken or turkey sandwich, the meat may be finely ground or chopped, or a chicken or turkey paste may be used.

Meat Sandwiches

Procedure: Use directions for chicken or turkey sandwiches Chili sauce or catsup may replace the mayonnaise.

Fish Sandwiches

Procedure: Cooked or canned salmon, tuna fish, lobster, crabmeat or flaked shrimp may be used. For 1 sandwich allow ¼ cup fish, 2 tablespoons minced celery and mayonnaise to moisten.

Cream or Cottage Cheese Sandwiches

[illegible]

Minced olives, chopped nuts, chives or minced onion and parsley may be mixed *with the cheese.*

Peanut Butter Sandwich

Procedure: For 1 sandwich use from 2 to 3 tablespoons peanut butter. If too thick to spread, moisten with cream or milk or with chili sauce or ketchup, which will add flavor. Serve between slices of buttered bread, or bread toasted on one side only. If desired, toasting may be done after sandwich has been filled. A tart jelly may be spread on top of the peanut butter.

Peanut Butter and Bacon Sandwich

Procedure: Mix 2 tablespoons peanut butter with 1 tablespoon cream or chili sauce Mince 1 strip cooked bacon and mix with peanut butter. Spread on 1 slice *hot* buttered toast or on 2 buttered halves of finger roll The latter may be put under the broiler for 2 minutes if desired

Salad Sandwich Roll

Procedure· Split a soft finger roll and spread with softened butter Pile chicken, crab or shrimp salad on each half. Garnish [illegible] pimiento or

[illegible]

may be piled with chicken or [illegible] and the other half with creamed butter mixed with deviled ham or anchovy paste

Bacon and Tomato Sandwich with Lettuce

Procedure: Toast 2 slices bread and trim crusts Put 1 slice on warm plate, cover with crisp lettuce and thick slices of skinned tomatoes Arrange crisp bacon on top of tomatoes and cover with other slice of toast. Cut diagonally into 3 sections. The tomatoes may be spread with mayonnaise if desired

Cheese Dream

Procedure. Toast 1 slice bread on one side Trim crust and butter untoasted side. On this arrange thin slices of American cheese Sprinkle with paprika and spread with prepared mustard if desired Place under broiler about 3 inches from heat and toast until cheese melts. Minced uncooked bacon or 2 strips of bacon may be placed on top of cheese before it is toasted. Serve with sliced skinned tomatoes if desired.

Club Sandwich

Procedure Toast 3 slices of bread lightly, trim edges evenly with long sharp knife and spread with butter. On the first slice arrange leaves of crisp lettuce and slices of cooked chicken Spread with mayonnaise and cover with second piece of toast. On this arrange sliced tomatoes. Spread tomatoes with mayonnaise and top with broiled bacon. Cover with third slice of toast and cut diagonally into 3 sections Garnish with lettuce and stuffed olives

Grilled Sardine Sandwich

Procedure: Toast 1 slice bread on one side and trim crust Arrange drained sardines on untoasted side, place under broiler about 5 inches from heat and toast about 3 minutes until sardines are thoroughly heated. Place on warm plate and sprinkle with lemon juice or serve with a lemon quarter.

Hot Mushroom Sandwich

Procedure: Use 2 slices buttered bread or 2 slices buttered toast. Trim crusts. Put 1 slice bread or toast on warm plate and cover with creamed mushrooms (p. 504). Cover with other slice and garnish with parsley or with sliced hard-cooked egg.

TEA SANDWICHES

Softened butter, cream cheese or a meat paste is generally the basis of filling for dainty sandwiches. The thinly sliced bread may be spread with softened butter or with cheese. The butter and the cream cheese may be flavored with minced water cress plus a little lemon juice and onion juice, if allowed. Anchovy paste may also be used as a flavoring Cream cheese may be thinned with sweet or sour cream and flavored with minced olives or chopped nuts. The meat paste should be thinned with sweet or sour cream and may be seasoned to taste The spread slices of bread may be covered with unspread slices if desired and cut with a sharp knife into squares or diamonds or with a fancy cutter Open sandwiches, or canapés as they are called, may be garnished with sliced hard-cooked eggs, sliced olives or strips of pimiento or green pepper, if allowed The spread slices, after the crusts have been trimmed evenly, or may be rolled and then fastened with a toothpick and garnished at the end with sprigs of parsley or water cress

QUICK BREADS

The leavening or the raising of dough can be produced by the combination of an acid with an alkali, sodium bicarbonate or baking soda. This action is quite fast, and for that reason is used in the preparation of doughs and batters for quick breads such as muffins, griddle cakes, biscuits, cakes and cookies Molasses and soda or sour milk and soda are used for certain products, but [illegible]

tartrate powders. (2) Acid salts of phosphoric acid which give the powders the name of phosphate. (3) Compounds of aluminum The aluminum compound used at present is sodium aluminum

sulfate. The manufacturers have designated this powder by the initials of the acid salt S.A.S. (4) Combinations of any of the above acid ingredients. The combination most frequently used is that of (2) and (3). This combination powder is frequently designated as S.A.S phosphate, and is commonly known as "double-acting" baking powder.

The chief difference between these powders is the reaction time in the cold. The tartrate powders react very quickly with the production of the carbon dioxide gas. Therefore, the mixtures containing them should not be beaten after the ingredients are thoroughly mixed, since the beating tends to drive out the gas. This is especially true of thin mixtures.

The aluminum salt S.A.S. is relatively insoluble in the cold dough or batter and requires heat to produce complete [illegible]

stand from 10 to 15 minutes at room temperature before baking. The phosphate is more soluble than the aluminum salt, but less soluble than the tartrate. It is intermediate in its reaction time.

At one time there was much discussion in regard to the wholesomeness of various baking powders, especially those containing aluminum compounds. Later research work with this type of baking powder, however, has resulted in confirmation of the theory that aluminum salts in the quantities in which they are usually found in breadstuffs are harmless As baking powders of this type are inexpensive, they are used largely today. When a combination powder replaces a baking powder of another type in a recipe, about one third less should be used.

Baking-powder mixtures will figure only slightly in the diet of the patient. Bran, whole-wheat and gluten muffins are the only baking-powder breads used to any extent. When baking-powder mixtures are used, they should be baked thoroughly.

Other Methods of Raising Batters. The raising of batter may be done by air and steam. Sponge cakes and angel cakes, which contain no chemical leavening agents, are raised by the expansion of the air beaten into the thin batter, and also by the steam generated from the heating of the water in the mixture. Steam plays the principal part in raising preparations which are made from thin batter—so thin that it allows the force of the steam to raise it.

Doughs and Batters. A mixture of flour and other ingredients combined with just enough liquid so that the dough may be rolled is known as a dough, while a thinner mixture is known as a batter. The latter usually contains eggs. Biscuits, cookies and pastry are examples of doughs; griddle cakes, muffins, popovers and waffles are examples of batters All-purpose flour is the choice for doughs and for all batters excepting fine cake, for which a highly refined cake flour is preferable.

To obtain a tender texture, both doughs and batters should be handled as little as possible. Doughs should be rolled only enough to produce the proper thickness; batter should be stirred just enough to moisten the dry ingredients thoroughly.

Recipes for biscuits and muffins of the standard type follow. Additional recipes for biscuits and muffins and for cookies and cakes will be found under "Allergy Recipes," Chapter 50

BISCUIT AND MUFFIN RECIPES

Biscuits and muffins, often known as quick breads, are easy to prepare Because of the comparatively small amount [illegible]



Fig 131. Mixing bran muffins

gredients, there should be no overstirring or beating. Muffin batter need not be free of lumps to produce a standard product that is light with a fluffy tender crumb free of large holes Biscuit dough should be kneaded lightly just long enough to smooth it in order to obtain a light, tender product

Both biscuits and muffins should be served as soon as possible after they come from the oven and should be arranged in a napkin for serving Leftover products may be reheated in a roll warmer or in the oven, if they are wrapped, or they may be split and toasted.

Baking Powder Biscuits

Ingredients:
- 1 cup sifted flour
- 1½ teaspoons baking powder
- ½ teaspoon salt
- 2 tablespoons shortening
- ⅜ cup milk (about)

Procedure Mix and sift the dry ingredients together Work in the shortening with tips of fingers or cut in with 2 knives Add the liquid all at once, mixing with a knife gently until flour is dampened Then stir quickly just until dough follows knife round bowl (about 30 strokes altogether) Pat or roll to ½ inch in thickness. Cut into rounds with a biscuit cutter Press trimmings together lightly, pat or roll and cut into rounds Place on ungreased baking sheet and bake in a hot oven (450° F) from 12 to 15 minutes Yield 8 biscuits

Drop Biscuits

Procedure Follow directions for baking powder biscuits Increase milk to ½ cup and omit kneading Drop by tablespoonfuls on ungreased baking sheet

Muffins

Family-size recipes for muffins demand only 1 egg. For this reason, and because a large number of muffins may be baked as easily as a small number, it

is well to prepare large recipes if the other members of the family besides the patient like hot breads. For a small recipe, beat egg before dividing into equal halves. The remaining half may be used for some other purpose in cooking. Both family-size and small-quantity recipes are given for muffins.

Plain Muffins

Family Size

Ingredients:
- 2 cups sifted flour
- 3 teaspoons baking powder
- 2 tablespoons sugar
- ½ teaspoon salt
- 1 egg
- 2 tablespoons melted shortening
- 1 cup milk
- Yield 16 small muffins

Small Quantity

Ingredients:
- 1 cup sifted flour
- 1½ teaspoons baking powder
- 1 tablespoon sugar
- ¼ teaspoon salt
- ½ egg
- 1 tablespoon melted shortening
- ½ cup milk
- Yield 8 small muffins

Procedure: Mix and sift the dry ingredients. Beat egg thoroughly and stir in melted shortening Add milk and stir well Stir this mixture all at once into the dry ingredients until they are just moist (about 15 strokes). Drop into greased muffin pans and bake in hot oven (425° F.) about 20 minutes if small muffin pans are used, from 25 to 30 minutes if large pans are used.

Corn-Meal Muffins

Procedure: Follow directions for plain muffins below. For family-size recipe: combine 1 cup sifted white flour with ¾ cup corn meal For small-quantity recipe: combine ½ cup sifted white flour with ½ cup corn meal.

Whole-Wheat Muffins

Procedure: Follow preceding directions for plain muffins. For family-size: combine 1 cup sifted white flour with the other dry ingredients and sift together. Add ¾ cup unsifted whole-wheat flour to this mixture. For small quantity combine ½ cup sifted white flour with the other dry ingredients and sift together. Add ½ cup unsifted whole-wheat flour to this mixture.

Rich Muffins

Family Size

Ingredients:
- 2 cups sifted flour
- 3 teaspoons baking powder
- ½ teaspoon salt
- ¼ cup shortening
- ¼ cup sugar
- 1 egg
- 1 cup milk
- Yield 16 small muffins

Small Quantity

Ingredients:
- 1 cup sifted flour
- 1½ teaspoons baking powder
- ¼ teaspoon salt
- 2 tablespoons shortening
- 2 tablespoons sugar
- ½ egg
- ½ cup milk
- Yield 8 small muffins

Procedure: Mix and sift dry ingredients. Cream shortening, add sugar and cream until fluffy. Stir in egg Add dry ingredients alternately with milk, beating well after each addition. Bake in greased muffin pans in moderately hot oven (425° F) from about 20 to 30 minutes.

Sally Lunn

Procedure: Follow preceding directions for rich muffins Pour batter into a greased cake pan 8 inches square. Sprinkle with ½ cup sugar mixed with 1 teaspoon cinnamon Bake in a moderate oven (375° F.) 30 minutes.

Bran Muffins

Family Size

Ingredients.
- 2 tablespoons shortening
- ¼ cup sugar
- 1 egg
- 1 cup bran
- ¾ cup milk
- 1 cup sifted flour
- 2½ teaspoons baking powder
- ½ teaspoon salt
- Yield 16 muffins

Small Quantity

Ingredients
- 1 tablespoon shortening
- 2 tablespoons sugar
- ½ egg
- ½ cup bran
- ⅜ cup milk
- ½ cup sifted flour
- 1¼ teaspoons baking powder
- ¼ teaspoon salt
- Yield 8 muffins

Procedure Cream shortening and sugar thoroughly Add unbeaten egg and beat well Stir in bran and milk Let soak until most of moisture is taken up Add sifted dry ingredients and stir only until flour disappears. Bake in greased muffin pans in moderately hot oven (400° F) about 30 minutes

STUDY QUESTIONS

1. Outline the use of grain in bread through history to the present day

2 *Why is wheat the chosen flour for* a yeast bread? Why was refined white flour used as a staple ingredient?

3 What additions to refined flour were obligatory during World War II? Should this program be continued?

4 Compare the relative amounts of various nutrients in white, in enriched and in whole-wheat flours

5. Which leavenings are used for raising quick breads? Give examples of their use.

6. How does a dough differ from a batter? How should each be handled so that the texture will be fine?

See Bibliography in Part Four for books on Cookery.

CHAPTER FORTY-NINE

Inexpensive Family-Size Recipes

The public-health nurse may find it necessary to help a family to utilize the food budget in such a way that food will be adequate. When a nutritionist is attached to the staff of the public agency with which the nurse works, a menu and recipe service will be available for distribution. As all social agencies do not have the advantage of the services of nutritionists, inexpensive family-size recipes are given in this chapter.

The following group of recipes can be suggested by the nurse to families in need of low-priced nutritious foods. The ingredients of the recipes have been chosen with due regard for cost. Evaporated milk, for instance, is generally less expensive than fresh milk. Instant nonfat dry milk is in general distribution under several brand names. Not all families are familiar with it, and as it is the most inexpensive form of milk, it may be important to demonstrate the

tions on economical food selection and menu planning.

Kitchen equipment often is limited, and dishes which can be made with utensils on hand should be chosen. If an oven is not available, dishes which can be cooked on top of the stove should be suggested. In the absence of a measuring cup, an 8-oz. glass may be used.

Another factor—and one of great importance—that must be considered is the customary food pattern of the family. This may be based upon national or regional customs that in many respects may be adequate although different from the common American choice of foods. The comparison below of the main dishes typical of 12 different countries, compiled by the Food and Nutrition Section, Welfare and Health Council, New York City, exemplifies this fact.

SOUPS

Bean Soup

Ingredients:
1½ cups navy beans
½ cup diced carrot

2 medium-sized onions, sliced
2 bay leaves
6 cups boiling water
½ cup milk, about
Salt
Pepper

Procedure. Soak beans 12 hours and drain Put beans, vegetables, bay leaves and water in saucepan Cover and simmer over low heat until beans are soft, about 2 hours, stirring occasionally to prevent burning Force through a sieve Add enough milk to desired consistency, Season with salt and pepper Reheat and serve Yield 6 generous servings

Note A meat bone, if one is on hand, may be cooked with the beans Peas and lentils may be used in place of the beans They may be cooked without soaking if directions on package so state

Milk Vegetable Chowder

Ingredients
4 tablespoons butter or other fat
1 medium-sized onion, sliced
3 cups mixed diced vegetables (potatoes, celery, carrots)
2 cups boiling water
2 cups milk or 1 cup evaporated milk diluted with 1 cup water
Salt, pepper

Procedure: Melt butter, add onion and cook 3 minutes Add vegetables and cook 3 minutes, stirring constantly over low heat Add water and cook until vegetables are tender Stir in milk slowly and heat Season to taste with salt and pepper. Yield 6 servings

Note Cooked leftover vegetables may replace part of the fresh vegetables and should be added with the milk.

Fish Vegetable Chowder

Procedure· Use recipe for milk vegetable chowder Reduce amount of diced vegetables 1½ cups and add from ½ to ¾ lb cut boned fish Leftover cooked fish may be used if it is added when the vegetables are almost tender

Food Customs

Area	Country	Main Dish	Ingredients
North America	U S. A.	Beef stew	Beef, carrots, onions, potatoes
	Mexico	Chili con carne	Chopped beef, onions, green peppers, beans, tomatoes, fat
South America and Caribbean	Brazil	Gzzadino	Beef, carrots, onions, tomato, celery
	Cuba	Picadillo Cubana (Cuban hash)	Ground beef and pork, onions, green peppers, capers, tomato paste, olives, raisins
Europe	England	Steak and kidney pie	Round steak, kidneys, onions, beef stock, flour, pie crust
	Denmark	Frikadeller (meat balls)	Ground beef and pork, flour, potatoes, eggs, onions, milk
	Poland	Zraziki Po Krakowsku (beef roll-ups)	Round steak, onions, bread crumbs, flour, egg, butter
Africa	Egypt	Eggplant and ground beef casserole	Ground beef, onion, eggplant, butter, tomato sauce
	Liberia	Perleau rice	Chicken, tomato paste, brown rice, onions, ham, cabbage, flour, fat
Near East	Israel	Fish soup	Mixed fish, onion, oil
Far East	India	Chicken curry	Chicken, onions, tomato, green pepper, butter, cottage cheese
	China	Lot Tsu Fan Kare Ngou Yuk (beef with peppers and tomatoes)	Beef, green peppers, tomatoes, cornstarch

MEAT DISHES

Goulash

Ingredients:
- 1 lb. stewing beef
- ½ lb. lean pork
- 2 pig or lamb kidneys
- 4 tablespoons bacon fat
- 3 tablespoons minced onion
- 1 cup canned tomatoes
- 1 teaspoon salt
- ⅛ teaspoon pepper
- 4 medium-sized potatoes, pared and cut in cubes

Procedure: Cut meat in 1-inch cubes and split kidneys. Remove membrane and tubes from kidneys, soak in salted water 30 minutes and slice. Heat bacon fat in heavy frying pan, add onion and meat and sauté until onions and meat are brown Add tomatoes, salt and pepper, and mix well. Cover and let simmer slowly 1 hour. Uncover, add potatoes, cover and cook until potatoes are tender Add a little water and more salt if necessary. Yield· 6 servings.

Liver, Sautéed

Procedure: Have beef, lamb or pork liver sliced ½ inch thick. Wipe with cloth and remove skin and tubes. Dredge with flour. Cook in hot, well-greased frying pan about 5 minutes, turning occasionally until well browned Add more fat as needed Season with salt and pepper. Be careful not to overcook liver Allow ¼ lb for each serving

Baked Liver with Vegetables

Ingredients:
- 1 lb. beef liver, sliced
- 1 teaspoon salt
- ⅛ teaspoon pepper
- 4 onions
- 2 carrots
- 2½ cups canned tomatoes

Procedure: Wipe liver, season with salt and pepper. Roll in flour. Cut onions and carrots in small pieces, put in frying pan, add sliced liver and canned tomatoes Cover Bake in moderate oven (375° F) or

Meat Loaf

Ingredients:
- 1 cup soft bread crumbs
- ½ cup milk or water
- 1 lb. chopped beef
- 1 egg (may be omitted)
- 1 onion, finely chopped
- 1 teaspoon salt
- ⅛ teaspoon pepper

Procedure: Soak bread crumbs in milk. Add other ingredients and mix well. Place in greased baking pan and bake in moderate oven (375° F.) 30 minutes, or until brown A chopped carrot or green pepper may be added, if desired Yield 6 servings

Meat Stew

Ingredients:
- 2 lbs. stewing beef or lamb
- *1 teaspoon salt*
- ⅛ teaspoon pepper
- 7 onions
- 4 cups boiling water
- 1 bay leaf
- 4 cloves
- 6 carrots
- 6 potatoes
- ½ cup flour

Procedure: Wipe meat and cut in 1-inch pieces. Sprinkle with salt and pepper and brown in its own fat. Peel and slice 1 onion, cook with meat until yellow. Add water, bay leaf and cloves, cover and cook over low heat 1½ hours. Add scraped carrots and remaining peeled onions; cook ½ hour Add peeled potatoes and cook until potatoes are tender Mix flour with cold water to a smooth paste and stir into stew. Add more salt if necessary. Stir until gravy begins to thicken Yield. 6 liberal servings

Note. The carrots may be replaced by 2 cups diced turnips.

Swedish Meat Balls

Ingredients:
- 2 cups soft bread crumbs
- ½ cup milk
- 2 tablespoons minced onion
- ¼ cup salad oil or bacon fat
- 1 lb chopped beef
- ½ teaspoon nutmeg
- 1½ teaspoons salt
- ¼ teaspoon paprika
- 1 egg, slightly beaten
- 2 tablespoons flour
- ½ cup milk

Procedure: Soak bread crumbs in milk 10 minutes Sauté onion in half the oil or bacon fat until light brown Add to meat with seasonings and slightly beaten egg. Add soaked bread crumbs and put mixture through meat grinder Form in small balls and sauté in frying pan in remaining fat until light brown on all sides. Sprinkle with flour, coating each, and cook 5 minutes Add milk, cover and cook 5 minutes Yield 16 to 18 small balls

Liver and Sausage Ring

Ingredients·
- 1 lb liver (beef, calves', pork or lamb)
- 1 lb pork sausage meat
- 2 tablespoons chili sauce
- 2 tablespoons horseradish
- 1 tablespoon grated onion
- 2 beaten eggs
- 2 cups dry bread crumbs
- 1 cup water

Procedure Cover liver with hot water. Cover and simmer 5 minutes. Put through food grinder, using fine plate. Add the remaining ingredients and mix thoroughly Fill greased 8½-inch ring mold. Bake in moderate oven (350° F) 1 hour Serve with chili sauce Yield 8 servings.

Braised Heart with Apples

Ingredients:
- 1 lamb heart
- Salt
- Pepper
- Flour
- ½ tablespoon drippings
- 1 tablespoon brown sugar
- 1 clove
- 1 small bay leaf
- ½ lemon, sliced
- ½ cup water
- 1 apple [illegible]

[illegible] lemon on top and add water. Cover tightly and simmer until tender. Add apple and continue cooking 15 minutes

Heart Fricassee

Ingredients:
- 1 lamb heart
- Flour
- 1 tablespoon bacon drippings
- ½ teaspoon salt
- Pepper
- 2 tablespoons diced onion
- ½ cup canned tomatoes

Procedure· Wash heart and trim off hard parts as necessary Cut each half in about 4 pieces Dredge in flour and brown in bacon drippings. Season Add onion and brown Add tomatoes and cover tightly, simmering until tender Yield 2 servings

Creole Kidney

Ingredients
- ½ beef kidney
- Flour
- 2 slices bacon
- 1 small onion, chopped
- 1 tablespoon chopped green pepper
- ½ cup tomato juice
- Salt
- Pepper
- 1 bay leaf
- ½ tablespoon flour
- Water

Procedure Remove tubes from kidney and cut into ½-inch slices Dredge with flour [illegible] Add tomato juice, salt, pepper and bay leaf Cover closely and simmer about ½ hour Mix flour and water to a paste. Add a small portion of the hot mixture, stirring to prevent lumping, then add this to the rest of the hot creole and cook until thickened, stirring constantly If desired, this may be served on toast points Yield 1 serving

CHEESE DISHES*

Main Dish Stuffed Potatoes

Ingredients·
- 2 large potatoes
- 1 cup cottage cheese
- ½ teaspoon pepper
- 1½ tablespoons melted fat
- ½ to 1 teaspoon salt

* Health Council of Greater New York.

MEAT DISHES

Goulash

Ingredients:

1 lb stewing beef
½ lb. lean pork
2 pig or lamb kidneys
4 tablespoons bacon fat
3 tablespoons minced onion
1 cup canned tomatoes
1 teaspoon salt
⅛ teaspoon pepper
4 medium-sized potatoes, pared and cut in cubes

Procedure: Cut meat in 1-inch cubes and split kidneys. Remove membrane and [illegible] until onions and meat are brown. Add tomatoes, salt and pepper, and mix well. Cover and let simmer slowly 1 hour. Uncover, add potatoes, cover and cook until potatoes are tender. Add a little water and more salt if necessary. Yield 6 servings.

Liver, Sautéed

Procedure: Have beef, lamb or pork liver sliced ¼ inch thick. Wipe with cloth and remove skin and tubes. Dredge with flour. Cook in hot, well-greased frying pan about 5 minutes, turning occasionally until well browned. Add more fat as needed. Season with salt and pepper. Be careful not to overcook liver. Allow ¼ lb for each serving.

Baked Liver with Vegetables

Ingredients:

1 lb beef liver, sliced
1 teaspoon salt
⅛ teaspoon pepper
4 onions
2 carrots
2½ cups canned tomatoes

Procedure: Wipe liver, season with salt and pepper. Roll in flour. Cut onions and carrots in small pieces, put in frying pan, add sliced liver and canned tomatoes. Cover. Bake in moderate oven (375° F.) or cook over low heat on top of stove about 30 minutes (until liver is tender). Add more seasoning, if necessary. Yield 6 servings.

Meat Loaf

Ingredients:

1 cup soft bread crumbs
½ cup milk or water
1 lb chopped beef
1 egg (may be omitted)
1 onion, finely chopped
1 teaspoon salt
⅛ teaspoon pepper

Procedure: Soak bread crumbs in milk. Add other ingredients and mix well. Place in greased baking pan and bake in moderate oven (375° F.) 30 minutes, or until brown. A chopped carrot or green pepper may be added, if desired. Yield 6 servings.

Meat Stew

Ingredients:

2 lbs. stewing beef or lamb
1 teaspoon salt
⅛ teaspoon pepper
7 onions
4 cups boiling water
1 *bay leaf*
4 cloves
6 carrots
6 potatoes
½ cup flour

Procedure: Wipe meat and cut in 1-inch pieces. Sprinkle with salt and pepper and brown in its own fat. Peel and slice 1 onion; cook with meat until yellow. Add water, bay leaf and cloves, cover and cook over low heat 1½ hours. Add scraped carrots and remaining peeled onions, cook ½ hour. Add peeled potatoes and cook until potatoes are tender. Mix flour with cold [illegible] 2 cups diced turnips.

Swedish Meat Balls

Ingredients.

2 cups soft bread crumbs
¾ cup milk
2 tablespoons minced onion
¼ cup salad oil or bacon fat
1 lb chopped beef
¼ teaspoon nutmeg
1½ teaspoons salt
¼ teaspoon paprika
1 egg, slightly beaten
2 tablespoons flour
½ cup milk

Scalloped "Ham," Potatoes and Carrots

Ingredients

- 1 can luncheon meat or
- ¾ lb frankfurters
- 2 tablespoons fat
- 2½ teaspoons flour
- 1 can condensed cream of mushroom soup, undiluted
- 1 cup milk*
- 3 cups pared sliced potatoes
- 1 cup scraped sliced carrots
- ¼ cup minced onion
- Salt and pepper

Procedure Heat oven to 375° F. Slice luncheon meat or split frankfurters lengthwise Brown lightly on both sides in fat in skillet Stir flour into fat left in skillet, add soup Then slowly stir in milk. Heat to just [illegible]

minutes. Uncover, bake 15 minutes longer or until potatoes are tender Yield 4 to 6 servings

Macaroni Meat Casserole

Ingredients.

- 1 cup uncooked macaroni
- 1 cup soft bread crumbs
- 1 tablespoon chopped onion
- ⅛ teaspoon pepper
- 2 eggs, beaten
- 1 teaspoon salt
- 1 cup milk
- ¾ cup ground beef or
- 1 cup diced cooked meat
- 1 8-oz. can tomato sauce, heated

Procedure Set oven for moderately slow, 325° F *Cook macaroni until tender*, according to package directions Drain. Mix with crumbs, onion, pepper, eggs, salt, milk and meat Turn into a 1½-qt. greased casserole Bake 40 to 45 minutes or until a knife inserted in center comes out clean Serve topped with tomato sauce Yield 6 servings.

* Fluid, evaporated, diluted with equal amounts of water, or reconstituted nonfat dry milk.

Macaroni with Frankfurters

Ingredients:

- 8 ozs elbow macaroni, about 2 cups
- 6 tablespoons margarine or bacon drippings
- 1 small onion, grated
- 6 tablespoons flour
- ½ teaspoon salt
- 3 cups milk
- 1 package (8 ozs) processed sharp American cheese
- *6 frankfurters*

Procedure: Cook macaroni in large amount boiling salted water until tender, drain, place in greased 2½-qt casserole While macaroni cooks, melt margarine in medium-size saucepan, blend in onion, flour, salt, stir in milk Cook over low heat, stirring constantly until sauce thickens and boils 1 minute Slice cheese into sauce, heat and stir until cheese melts Pour over cooked macaroni in baking dish, stir with fork to blend Score frankfurters with sharp knife, arrange on top, pressing them lightly into macaroni mixture Bake in moderate oven (350° F) 30 minutes, or until brown and bubbly on top Yield 6 servings

Baked Macaroni with Tomatoes

Ingredients·

- 1 package macaroni
- 4 tablespoons bacon fat
- 1 medium-sized onion, sliced
- ¼ cup minced green pepper
- 2½ cups canned tomatoes
- ½ teaspoon salt
- ⅛ teaspoon pepper
- ¼ lb sliced cheese

Procedure: Cook macaroni as directed on package, rinse, drain and arrange in greased 2-qt casserole Melt bacon fat in frying pan, add onion and green pepper, and cook 1 minute Add tomatoes, salt and pepper (adding more if necessary) and pour over macaroni Cover with sliced cheese. Bake in moderately hot oven (400° F) about 20 minutes (until cheese melts). Yield 6 liberal servings

Scalloped Potatoes

Ingredients:

- 6 medium-sized potatoes
- Salt
- Pepper
- 2 tablespoons flour
- 2 cups evaporated milk diluted with
- 2 cups water

Procedure: Bake potatoes in moderately hot

fat; sprinkle with paprika Bake in moderately hot oven (375° F.) about 15 to 20 minutes until lightly browned on top and thoroughly heated Yield 4 servings.

Cheese and Vegetable Casserole

Ingredients:

1½ cups milk*
2 tablespoons margarine
1 cup soft bread crumbs
6 ozs grated process American *Cheddar cheese (1½ cups)*
2 tablespoons minced onion
⅛ teaspoon pepper
½ teaspoon salt
3 eggs, well-beaten
1 cup drained, cooked or canned vegetables

Procedure: Heat oven to 325° F. Heat milk with margarine. Pour over bread crumbs in mixing bowl. Add next 4 ingredients. Mix well Slowly stir in eggs Arrange vegetables in greased 1½-qt. casserole, pour cheese mixture over them. Set casserole in pan, filled with warm water up to within 1 inch of top of casserole. Bake 75 minutes, or until silver knife, inserted in center, comes out clean Serve as is or with mushroom sauce. Yield. 4 servings.

Gnocchi with Cheese Sauce

Procedure: Add 1 teaspoon salt to 3 cups water and bring to boil. Sprinkle ⅔ cup quick-cooking farina gradually into boiling

beaten egg. Stir until blended Pour into greased pan or dish (about 8 x 8 inches) and chill well Cut into 1½-inch squares and place in greased shallow baking dish Pour cheese sauce over this.

* Fluid, or evaporated, *diluted with* equal amounts of water, or reconstituted nonfat dry milk

Cheese Sauce for Gnocchi

Ingredients:

3 tablespoons margarine
2 tablespoons flour
1 teaspoon salt
⅛ teaspoon pepper
1 teaspoon dry mustard
1 teaspoon finely chopped onion
2 cups milk, or 1 cup evaporated milk and 1 cup water
½ pound cheese, shredded

Procedure: Melt margarine over low heat. Add flour, salt, pepper, mustard and onion and stir until well blended. Remove from heat. *Gradually stir in milk and return to* moderate heat. Cook, stirring constantly, until thick and smooth. Add cheese, reserving ½ cup to sprinkle on top, and stir over low heat until cheese is melted Pour sauce over gnocchi and sprinkle with the ½ cup *cheese Bake in moderate oven (375° F) 30* minutes Yield. 6 servings

MISCELLANEOUS MAIN DISHES

Spanish Beans with Liver

Ingredients

1 12-oz. package red kidney beans (1½ cups)
1 qt. cold water
1 cup canned tomatoes
2½ teaspoons salt
¼ teaspoon pepper
1 bay leaf
2 sliced medium onions
1 minced peeled clove garlic
¼ cup fat or salad oil
½ lb. sliced beef liver
1 tablespoon flour

cups Add to beans with tomatoes and next *3 ingredients Fry onions and garlic* in fat in a skillet until tender, then add them to beans, reserving oil Cover, bring to boil and simmer 2 hours or until beans are tender Meanwhile, dredge liver in flour and fry in reserved oil in skillet until brown on both sides Cut liver in ½-inch strips, then fold into beans and serve Yield 4 to 5 servings.

Baked Beans, New York Style

Procedure Follow preceding recipe for baked beans, New England style, substituting ¼ cup brown sugar, firmly packed, for the molasses Also, marrow beans may be used to replace the pea beans If desired, the salt pork may be sautéed from 3 to 5 minutes before combining with the beans.

NOTE If an oven is not available, beans may be "baked" by simmering in a heavy covered pot on top of the stove More liquid may be added during the cooking, if necessary

Chili Con Carne

Ingredients·
- 2 tablespoons bacon fat
- 1 medium-sized onion, minced
- 1 clove garlic, peeled
- 1 lb. chopped beef
- 2 cups canned or cooked kidney beans
- 1 teaspoon salt
- Pepper
- ½ teaspoon chili powder
- 2½ cups canned tomatoes

seasonings and tomatoes, mix well Put in greased 1½-quart casserole, sprinkle with cheese and bake in moderate oven (375° F) from 15 to 20 minutes, or cover and cook over low heat on top of stove Yield 6 servings

Lima Beans, Baked

Ingredients
- ¼ lb diced salt pork
- ½ cup sliced onions
- 1 cup diced carrots
- 3 cups boiled dried Lima beans
- 2½ cups canned tomatoes

Procedure. Cook salt pork 5 minutes in heavy frying pan, add onions and carrots, and sauté over medium heat 5 minutes Add cooked, drained Lima beans, mix well and place in greased casserole Add tomatoes, cover and bake in moderate oven (350° F) about 3 hours (until beans are tender). Yield 6 servings

NOTE Use leftover baked Lima beans as foundation for soup

FISH DISHES

Codfish, Creamed

Ingredients
- 2 cups salt codfish
- 4 tablespoons butter or margarine
- 4 tablespoons flour
- ¼ teaspoon pepper
- 2 cups milk

Procedure Soak codfish in cold water 20 minutes to remove some of the salt, drain. Cut in small pieces Melt butter or mar-

Baked Cod Fillets Florentine

Ingredients
- 1 pkg frozen chopped spinach
- 2 tablespoons margarine
- 2 tablespoons flour
- ½ teaspoon salt
- 2 tablespoons chopped onion
- 1 cup milk
- 1 pkg frozen cod fillets
- Dash of pepper
- 1 cup soft bread crumbs
- 2 tablespoons melted margarine

Procedure Set oven for hot, 425° F Cook spinach according to package directions.

Fish Pie

Ingredients
- 2 cups flaked cooked fish
- 1 cup medium white sauce
- 2 teaspoons onion juice
- 1 teaspoon lemon juice
- 2 cups mashed potatoes
- 2 tablespoons grated cheese
- ½ cup fine bread crumbs
- 2 tablespoons melted margarine

Procedure: Wash and pare potatoes and cut in very thin slices. Place potatoes in greased 2-qt baking dish Sprinkle with salt, pepper and flour. Pour in milk so that it can be seen through the top layer. Cover and bake in moderate oven (375° F.) 30 minutes Remove cover and continue baking about 15 minutes longer, until potatoes are tender and a brown crust has formed on the top. Yield. 6 servings

NOTE If desired, 2 *tablespoons minced* onion may be added to the potatoes. Leftover minced ham may be added.

Spanish Rice

Ingredients:

¼ cup salad oil
1 clove garlic, peeled
1 medium-sized onion, minced
¼ cup chopped green pepper
3 cups boiled rice
1 teaspoon salt
2½ cups canned tomatoes

Procedure: Heat salad oil in large frying pan Add garlic, onion, green pepper and rice, and cook 3 minutes, stirring constantly. Add salt and tomatoes. Mix well, cover and cook over low heat until tomato juice is absorbed, about 15 minutes Yield. 6 servings

NOTE Add 1 cup chopped cooked meat, *if desired*

Spaghetti, Italian Style

Ingredients

¼ cup salad oil or bacon fat
1 clove garlic, peeled
½ lb chopped beef or veal
3 tablespoons minced green pepper
3 tablespoons minced onion
2½ cups canned tomatoes
1 4-oz can tomato paste
1 teaspoon salt
2 teaspoons sugar
1 cup boiling water
1 *package spaghetti*
Grated cheese

Procedure: Heat salad oil or bacon fat in heavy saucepan Add garlic and chopped beef or veal, green pepper and onion, and sauté 5 minutes, stirring frequently, until meat is well browned. Remove garlic if desired. Force tomatoes through a sieve and add tomato paste, salt, sugar and water. Let simmer uncovered over low heat about 1½ hours, until *mixture is thick. Stir occa*sionally to prevent sticking. Cook spaghetti as directed on package, rinse, drain and arrange on hot platter. Pour sauce round it and sprinkle with cheese. *Yield* 6 servings.

Toasted Cheese

Ingredients:

1 teaspoon salt
¼ teaspoon dry mustard
⅛ teaspoon paprika
½ lb cheese
2 eggs
1 cup milk

Procedure: Mix seasonings in greased 9-inch pie pan Flake cheese with a fork or grate into pan. Break eggs over cheese, add *milk and mix with fork. Set in pan of hot* water and bake in a moderate oven (375° F.) until set, from about 35 to 40 minutes. Yield 4 servings

NOTE. 1 *instead of* 2 *eggs may be used.*

Baked Beans, New England Style

Ingredients:

1 qt. pea beans
¼ lb salt pork
1 tablespoon salt
1 teaspoon dry mustard
¼ cup molasses

[illegible]

simmer over low heat [illegible] when tested To test take up a few beans with spoon and blow When skins break, the beans are tender. Drain beans and [illegible]

[illegible]

boiling water, if necessary, to cover beans *entirely. Cover and bake in very* slow oven (250° F) from 6 to 8 hours. Add more water when necessary Uncover and bake 30 minutes longer (until a brown crust has formed) Yield *10 to 12 servings.*

NOTE If desired, 1 medium-sized onion, minced, may be baked with the beans.

water Bake in moderate oven (375° F.) until set, about 35 minutes. The custard is cooked when mixture does not adhere to knife when inserted. Cool quickly by *placing cups in cold water. Yield 6 custards*

Bread Pudding

Ingredients

- 3 tablespoons softened butter or margarine
- *4 to 5½-inch slices bread*
- 2 eggs or 4 egg yolks, slightly beaten
- ½ cup sugar
- ¼ teaspoon salt
- 1 cup evaporated milk diluted with
- 1 cup water, and scalded
- ½ teaspoon vanilla

Procedure Butter bread and arrange in baking dish Combine slightly beaten eggs or egg yolks, sugar and salt. Add hot milk slowly and stir until sugar is dissolved Stir in vanilla *Pour mixture over bread, place* baking dish in pan of hot water and bake in slow oven (325° F) until custard begins *to set, about 40 minutes Serve hot or* chilled Yield 6 servings

Chocolate Blanc Mange

Ingredients:

- 1½ cups evaporated milk
- *1½ cups water*
- 4 tablespoons cornstarch or 8 tablespoons flour
- 5 tablespoons cocoa
- 6 tablespoons sugar
- ¼ teaspoon salt
- 1 teaspoon vanilla

Procedure Mix milk with 1¼ cups water in top of double boiler and scald over hot water Mix cornstarch or flour, cocoa, sugar and salt Stir in remaining water to this mixture, and when smooth stir into scalded milk Stir over hot water until thick Cover and continue cooking 5 minutes or more *over the hot water Stir in vanilla, pour* into bowl or 6 custard cups and chill Yield 6 servings

Fruit Custard Pudding

Ingredients:

- *1 cup evaporated milk*
- 1¾ cups cold water
- 2 tablespoons cornstarch
- *1 egg*
- ⅛ teaspoon salt
- ¼ cup sugar
- *½ teaspoon vanilla*

Procedure Mix milk with 1 cup cold water and scald in top of double boiler over hot water Mix cornstarch with remaining cold water (¾ cup) to a smooth paste and stir *into scalded milk Beat egg slightly, add* salt and sugar, and mix with a small portion of the hot mixture, then add slowly to the contents of the double boiler Stir until thickened Add vanilla Serve over sliced bananas or oranges, berries or other fruit, or with cottage pudding

Rice Pudding

Ingredients

- ½ cup rice
- 2 cups evaporated milk diluted with
- 2 cups water
- ¼ teaspoon salt
- ½ cup sugar
- ¼ teaspoon nutmeg

Procedure· Combine all ingredients and pour into well-greased baking dish Bake in very slow oven (250° F) about 2 hours, stirring at least 3 times during the first hour *to break crust that forms Do not stir during* last hour of cooking Chill before serving. Yield 6 servings

Note. Add ½ cup raisins before baking, if desired.

Scandinavian Prune Pudding

Ingredients·

- ½ lb prunes
- 3½ cups water
- 1 1-inch stick cinnamon
- ½ cup sugar
- ¼ teaspoon salt
- 5 tablespoons cornstarch
- 1 tablespoon lemon juice

Procedure· Wash prunes, cover with 3 cups water and let stand 2 hours Cook in covered saucepan until soft, about 20 minutes Drain, save juice and pit prunes Return fruit and juice to saucepan, and add cinnamon Combine sugar, salt and cornstarch. Mix with remaining cold water and add to fruit Cook over low heat, stirring *constantly, until mixture thickens, about 5* minutes Remove cinnamon, add lemon juice, pour into mold and chill. Yield 6 servings

Procedure: Mix fish, white sauce and seasonings Pour into greased baking dish. Smooth mashed potatoes over top. Sprinkle with cheese and combined crumbs and margarine. Bake in hot oven (400° F.) 20 minutes. Yield 6 to 8 servings.

Medium White Sauce: Melt 2 tablespoons margarine in heavy saucepan. Add 2 tablespoons flour, mix well. Add 1 cup milk. Cook, stirring constantly, until thickened. Season with salt and pepper. Yield. 1 cup

Creole Fish and Potatoes

Ingredients:
- 1 lb. package haddock fillets, quick-frozen
- 3 tablespoons bacon drippings or fat
- ½ cup onions, sliced
- 3 cups potatoes, raw, sliced
- 1 tablespoon flour
- 1½ teaspoons salt
- ⅛ teaspoon pepper
- 2½ cups canned tomatoes (No. 2 can)

[illegible]

top of potatoes, cover. After the mixture begins to bubble, continue cooking about 15 minutes Yield 4 servings.

Tuna-Egg Scallop

Ingredients:
- 1 7-oz. can light or white tuna
- 1 tablespoon lemon juice
- 2 tablespoons butter or margarine
- 4 tablespoons flour
- ¼ teaspoon dry mustard
- 2½ cups milk
- 3 hard-cooked eggs, chopped
- 1 tablespoon minced parsley
- ¼ teaspoon Tabasco
- 1 cup soft buttered bread crumbs

Procedure· Drain oil from tuna and reserve Break tuna into pieces and add lemon juice Melt butter or margarine, add tuna [illegible]

with buttered bread crumbs. Bake in moderate oven (375° F.) 25 minutes, or until crumbs are lightly browned. Yield 4 to 6 servings

Tuna Fish Loaf

Ingredients:
- 2 cups tuna (about 13 ozs.)
- ¾ cup soft bread crumbs
- ½ cup milk
- 2 eggs
- 1 teaspoon salt
- Cayenne
- 1 tablespoon lemon juice
- 1 tablespoon chopped parsley

Procedure: Flake fish in its own oil Soak bread crumbs in milk for 5 minutes. Stir in unbeaten eggs, seasonings and fish Pour mixture into greased loaf pan and bake in moderate oven (375° F.) for 40 minutes until firm in the center. Yield. 4 servings

DESSERTS

Baked Apple Pudding

Ingredients
- 7 ½-inch slices bread
- 4 tablespoons butter or margarine
- 3 sliced apples
- 1 cup sugar

[illegible]

Baked Rhubarb Pudding

Procedure: Follow recipe for baked apple pudding, substituting 4 cups rhubarb for the apples If rhubarb is very tart, more sugar may be added

Baked Custard

Ingredients
- 3 eggs, slightly beaten
- 3 tablespoons sugar
- ⅛ teaspoon salt
- 1½ cups evaporated milk diluted with 1½ cups water
- Nutmeg

Procedure· Combine slightly beaten eggs, sugar, salt and milk, and stir until sugar is dissolved Pour into custard cups, sprinkle with nutmeg and place cups in pan of hot

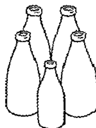
MILK IN DIFFERENT FORMS

THE FOLLOWING ARE ABOUT EQUAL IN FOOD VALUE


+


ONE POUND PACKAGE NONFAT DRY MILK SOLIDS (DRY SKIM MILK) PLUS 6¾ OUNCES BUTTER OR VITAMIN "A" FORTIFIED FAT

=



4½ QUARTS WHOLE MILK

=



5½ CANS EVAPORATED MILK 14½ OUNCES EACH CAN

Figure 132

use water as the liquid in the recipe For example, if your recipe calls for 1 cup milk, add 3 tablespoons dry skim milk to other dry ingredients before mixing or sifting Then follow recipe but use 1 cup water instead of the cup of milk listed in recipe

SPECIAL RECIPES FOR USING DRY SKIM MILK

Dry skim milk may be used conveniently in some recipes without reconstituting with water.

Basic Cream Sauce

Ingredients

- 2 tablespoons fat
- 2 tablespoons flour
- 3 tablespoons dry skim milk
- ⅛ teaspoon salt
- 1 cup water (or water in which vegetables were cooked)

Procedure: Melt fat Remove from heat Mix flour, dry skim milk and salt Add to fat, mixing until well blended. Gradually add water, stirring until well mixed. Cook over low heat, stirring constantly until thick and smooth, about 5 minutes Yield about 1 cup

Potato Chowder

Ingredients:

- 1 teaspoon salt
- 6 cups boiling water
- 4 medium-sized potatoes, thinly peeled and sliced
- 1⅛ cups dry skim milk
- ⅛ lb salt pork, diced, or 3 tablespoons vegetable shortening
- 1 medium-sized onion, sliced
- 1 green pepper, diced
- 4 tablespoons chopped celery leaves, if desired

Procedure Add salt to the boiling water and boil potatoes 5 or 8 minutes, or until tender. Drain Save water There should be from 4¼ to 5 cups Mash potatoes Gradually beat in ⅜ cup dry skim milk with fork or spoon. Beat in ⅛ cup reserved potato water Add remaining dry skim milk Mix well. Add remaining potato water Cook salt pork until browned Add onion, green pepper and celery leaves Cook 5 minutes, or until tender and lightly browned Add to potato mixture Bring to boiling point, stirring frequently Yield 4 to 5 servings.

Fish Chowder

Ingredients.

- *3 tablespoons fat*
- 2 medium-sized onions, sliced
- 2 cups diced potatoes (about 2 medium sized)
- ⅞ lb fish, cut in pieces (uncooked)
- *1 carrot, sliced, if desired*
- 2 teaspoons salt
- ⅛ teaspoon pepper
- 7⅛ cups water
- *3 tablespoons flour*
- 1⅛ cups dry skim milk

Molasses Cake

Ingredients
- 2¼ cups sifted flour
- ¾ teaspoon baking soda
- 1 teaspoon baking powder
- ½ teaspoon salt
- 1 teaspoon cinnamon or allspice
- 1 teaspoon ginger
- ½ teaspoon cloves
- 1 egg
- ½ cup melted shortening
- 1¼ cups molasses
- ¾ cup hot water

Procedure. Mix and sift dry ingredients. Beat egg, stir in melted shortening and molasses. Add sifted dry ingredients alternately with hot water, beating well after each addition. Bake in a greased 9 x 9 x 2 pan in moderate oven (300° F) 45 minutes Cut into squares; serve hot or cold. Yield 16 portions.

One-Egg Cake (Cottage Pudding)

Ingredients.
- 2 cups sifted flour
- 3 teaspoons baking powder
- ¾ teaspoon salt
- ⅓ cup shortening
- 1 cup sugar
- 1 egg
- ¾ cup milk
- 1 teaspoon vanilla

Procedure: Mix and sift flour, baking powder and salt. Cream shortening, add sugar slowly and cream until fluffy. Add unbeaten egg and beat well Add sifted dry ingredients alternately with milk, stirring well after each addition Add vanilla Bake in 2 greased 9-inch layer-cake pans, or in greased muffin pans, in moderate oven (375° F) about 25 minutes, or bake in 1 greased 8-inch square pan in moderate oven (350° F.) about 50 minutes Cool and frost as desired or use hot with sauce for cottage pudding Yield 2 layers, about 16 medium-sized cup cakes or 1 square.

Molasses Cookies

Ingredients·
- 1 teaspoon soda
- 1 tablespoon warm water
- 2½ cups sifted flour
- 1 teaspoon ginger
- 1 teaspoon cinnamon
- ¼ teaspoon salt
- ½ cup shortening
- ½ cup sugar
- ½ cup molasses

Procedure: Dissolve soda in warm water and set aside to cool. Mix and sift flour, spices and salt. Cream shortening, add [illegible]

to make a stiff dough. Roll out thin on a lightly floured board. Cut into shapes and bake in a moderate oven (375° F.) from 8 to 10 minutes. Yield 4 dozen cookies

THE USE OF DRY SKIM MILK

As nonfat dry milk is the most inexpensive form of milk, it can be used to great advantage in the limited food budget. Another advantage is that it can be kept in the package on the kitchen shelf without refrigeration. It has the same food value as skimmed fresh milk Standard recipes may be used if the powdered dry milk is combined with water in equal amount to the milk indicated in the recipe

Reconstitution of Dry Skim Milk

Ingredients:
- 3 tablespoons dry skim milk + 1 cup water can be used instead of 1 cup milk
- 6 tablespoons dry skim milk + 1 pint water can be used instead of 1 pint milk
- ¾ cup (12 tbsps) dry skim milk + 1 quart water can be used instead of 1 quart milk

Procedure· Consult label on package of nonfat dry milk for method of reconstitution Nonfat dry milk or, as it is often called, dry skim milk is available in powdered form under several brand names It dissolves instantly in cold water, and it is not necessary to shake or beat the mixture, as was the case formerly. A chocolate-flavored milk of this type is also distributed in the retail market.

[illegible] skim milk keep [illegible]

convenient to use dry skim milk in dry form. To use dry skim milk in dry form, just add dry skim milk to the other dry ingredients, such as f[illegible] and then

Recipes
Low Caloric
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Allergy
Ketogenic
Gluten Free
Low Sodium

CHAPTER FIFTY

Recipes for Therapeutic Diets

LOW CALORIC RECIPES

Cookery for those who must reduce weight or for any other reason must limit the caloric content of the diet may involve both subtraction and addition This will depend upon the dietary regimen prescribed by the physician In most dietary prescriptions, the reduction of fats, oil, sugar and flour in the quantities used in standard recipes is necessary In the interests of flavor, however, certain additions to or replacements in low caloric recipes can well be made For instance, lean meats that lack natural fat and must be cooked with little fat often will be more palatable when onion, garlic, tomato, celery, chives and other herbs are used These seasonings are also valuable in salad dressings, especially when they are made without oil It should be remembered that some of the above seasonings especially those of the onion, garlic and chives group, are among the most likely to cause digestive disturbances For this reason the patient should be consulted before using them There are a number of savory dressings with low caloric count that are suitable for use with both vegetable and fruit salads, as well as with greens.

When a low fat diet is prescribed, skim milk, now generally available in dry as well as in fresh form, is satisfactory in soups, desserts and some beverages, and may be used with cereal

For those who find it difficult to eliminate sweets, saccharin and Sucaryl are palatable when they are used according to tested recipes

Another product, unflavored gelatin, that has low caloric value, is sometimes an asset in meal preparation, as it gives body that may otherwise be absent in a jellied soup, a salad or a dessert It extends the apparent size of fruit combinations, and it may serve in the same way when used as an extender for meat or fish. It may also be used with fruit and vegetable juices to increase protein content without materially increasing the calorie count.

Many of the recipes suitable for use in Diabetes (*see* Diabetic Recipes, pp 552 to 555) will also be found useful in a reducing diet

Beverages

Saccharin or Sucaryl may be substituted for sugar in any beverage in which the other ingredients comply in the proportion allowed on the special diet. The

Procedure: Melt drippings. Add onions Cook until soft and light brown in color. [illegible]

[illegible] ened Yield 6 generous servings.

Creamed Noodles with Carrots

Ingredients:

- 2 cups diced carrots
- ½ package noodles
- 3 tablespoons drippings
- 1 medium-sized onion, sliced
- ⅔ cup dry skim milk
- 4 tablespoons flour
- 1 teaspoon salt
- ⅛ teaspoon pepper
- 2 cups carrot stock
- ½ to 1 cup leftover diced chicken or meat, if available, or ½ cup grated cheese

Procedure: Cook carrots covered in 2½ cups boiling salted water until tender. Drain and reserve liquor Cook noodles in generous amount of boiling salted water until tender and drain. Melt drippings in frying pan, add onion and cook over low heat until yellow Mix dry skim milk, flour, salt and pepper. Sprinkle over the reserved carrot liquor and beat until well blended Add [illegible]

Yield 6 servings.

NOTE: Leftover cooked carrots and noodles (2 cups) *may be used. Water may replace the carrot stock.* String beans, peas or cabbage, or a mixture of vegetables, may replace the carrots.

Apple Crumble

Ingredients:

- ½ cup sifted flour
- ⅔ cup dry skim milk
- ½ cup butter, margarine or other shortening
- 3 tablespoons sugar
- ¼ teaspoon nutmeg
- ¼ teaspoon salt
- 1 teaspoon cinnamon, if desired
- 3 cups sliced apples (or about 2 large apples, sliced)

Procedure: [illegible]

Arrange apples in shallow, well-greased baking dish. Sprinkle apples with flour mixture. Bake in moderate oven (350° F.) about 25 minutes, or until apples are tender. Remove cover and bake 10 minutes longer, or until crumbs are brown Good hot or cold with milk or cream. Yield, 6 servings.

Baked Custard

Ingredients:

- ½ cup dry skim milk
- ½ cup sugar
- ¼ teaspoon salt
- 3 eggs, slightly beaten
- 3 cups boiling water
- ½ teaspoon vanilla

[illegible] in center comes out clean. Yield. 6 servings.

Cocoa

Ingredients:

- 5 tablespoons cocoa
- 5 tablespoons sugar
- Dash of salt
- ½ cup water
- 1½ cups dry skim milk mixed with 1 qt. water
- ½ teaspoon vanilla, if desired

[illegible] ings.

See Bibliography in Part Four for books on Cookery.

Recipes
- *Low Caloric*
- *Diabetic*
- *High Caloric, High Protein*
- *Allergy*
- *Ketogenic*
- *Gluten Free*
- *Low Sodium*

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When a low fat diet is prescribed, skim milk, now generally available in dry as well as in fresh form, is satisfactory in soups, desserts and some beverages, and may be used with cereal

For those who find it difficult to eliminate sweets, saccharin and Sucaryl are palatable when they are used according to tested recipes

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Many of the recipes suitable for use in Diabetes (*see* Diabetic Recipes, pp 552 to 555) will also be found useful in a reducing diet

Beverages

Saccharin or Sucaryl may be substituted for sugar in any beverage in which the other ingredients comply in the proportion allowed on the special diet. The

Procedure: Melt drippings. Add onions. Cook until soft and light brown in color. Add potatoes, fish, salt, pepper, carrot and 6½ cups water. Cover and cook gently about 15 minutes or until potatoes are tender. Mix together flour and dry skim milk. Slowly add remaining 1 cup of water, mixing until smooth. Add to chowder, stirring constantly. Cook 5 minutes or until thickened. Yield 6 *generous servings.*

Creamed Noodles with Carrots

Ingredients:

- 2 cups diced carrots
- ½ package noodles
- 3 tablespoons drippings
- 1 medium-sized onion, sliced
- ½ cup dry skim milk
- 4 tablespoons flour
- 1 teaspoon salt
- ⅛ teaspoon pepper
- 2 cups carrot stock
- ½ to 1 cup leftover diced chicken or meat, if available, or ½ cup grated cheese

Procedure: Cook carrots covered in 2½ cups boiling salted water until tender. Drain and reserve liquor. Cook noodles in generous *amount of boiling salted* water until tender and drain. Melt drippings in frying pan, add onion and cook over low heat until yellow. Mix dry skim milk, flour, salt and pepper. Sprinkle over the reserved carrot liquor and beat until well blended. Add slowly to onions, while stirring constantly over low heat. Continue stirring until [illegible]

Yield 6 *servings*

NOTE Leftover cooked carrots and noodles (2 cups) may be used. Water may replace the carrot stock. String beans, peas or cabbage, or a mixture of vegetables, may replace the carrots.

Apple Crumble

Ingredients:

- ¾ cup sifted flour
- ½ cup dry skim milk
- ½ cup butter, margarine or other shortening
- 3 tablespoons sugar
- ¼ teaspoon nutmeg
- ¼ teaspoon salt
- 1 teaspoon cinnamon, if desired
- 3 cups sliced apples (or about 2 large apples, sliced)

Procedure: Mix flour, dry skim milk, sugar, nutmeg, salt and cinnamon. Cut shortening in with 2 *knives or pastry blender until* mixture is crumbly.

Arrange apples in shallow, well-greased baking dish. Sprinkle apples with flour mixture. Bake in moderate oven (350° F.) about 25 minutes, or until apples are tender. Remove cover and bake 10 minutes longer, or until crumbs are brown. Good hot or cold with milk or cream. Yield. 6 servings.

Baked Custard

Ingredients:

- ½ cup dry skim milk
- ½ cup sugar
- ¼ teaspoon salt
- 3 eggs, slightly beaten
- 3 cups boiling water
- ½ teaspoon vanilla
- [illegible]

[illegible]

Sprinkle with nutmeg. Place in pan of hot water and bake in a moderate oven (375° F) about 30 minutes, or until knife inserted in center comes out clean. Yield. 6 servings.

Cocoa

Ingredients:

- 5 tablespoons cocoa
- 5 tablespoons sugar
- Dash of salt
- ½ cup water
- 1½ cups dry skim milk mixed with 1 qt. water
- ½ teaspoon vanilla, if desired

Procedure: Mix cocoa, sugar and salt with ½ cup of water until smooth. Boil over direct heat 2 minutes, stirring all the time. Add dry skim milk mixed with water. Heat to boiling. Add vanilla. Yield 5 to 6 servings.

See Bibliography in Part Four for books on Cookery.

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CHAPTER FIFTY

Recipes for Therapeutic Diets

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When a low fat diet is prescribed, skim milk, now generally available in dry as well as in fresh form, is satisfactory in soups, desserts and some beverages, and may be used with cereal

For those who find it difficult to eliminate sweets, saccharin and Sucaryl are palatable when they are used according to tested recipes

Another product, unflavored gelatin, that has low caloric value, is sometimes an asset in meal preparation, as it gives *body that may otherwise be absent in* a jellied soup, a salad or a dessert It extends the apparent size of fruit combinations, and it may serve in the same way when used as an extender for meat or fish It may also be used with fruit and vegetable juices to increase protein content without materially increasing the calorie count.

Many of the recipes suitable for use in Diabetes (see Diabetic Recipes, pp 552 to 555) will also be found useful in a reducing diet

Beverages

Saccharin or Sucaryl may be substituted for sugar in any beverage in which the other ingredients comply in the proportion allowed on the special diet The

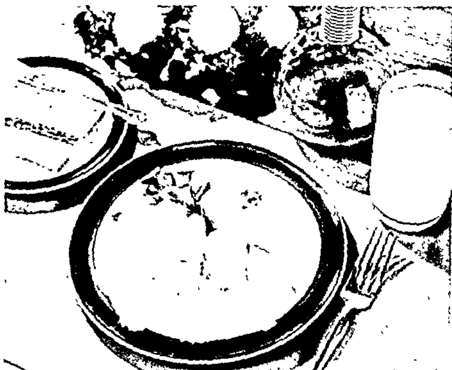


Fig. 133. A satisfying luncheon that is low in calories.

usual allowance for 1 cup of unsweetened liquid is ¼ gr. saccharin tablet or ⅛ Cm. Sucaryl tablet or ⅛ teaspoon Sucaryl solution.

Soups

Soups made from meat stock, strained, [illegible]

This also is true when these products are jellied or bought in the form of "madrilene." Clam juice also lacks calories Any of these clear soups may be flavored [illegible] and savory seasonings [illegible]

tion, will still have a low caloric content, as it will when it is jellied. In this same class is a vegetable soup when made with either a stock or tomato juice. A milk vegetable soup made without stock, while higher in caloric count, will be much lower than a cream soup.

Jellied Consommé

Ingredients:
- 1 envelope unflavored gelatin
- 2 cups well-seasoned soup stock or consommé
- *Sliced lemon*
- *Minced parsley*

Procedure. Soften gelatin in ¼ cup stock. Heat remainder of stock and stir into gelatin. Chill. When set, beat lightly with a fork and serve in soup cups. Serve each with slice of lemon dipped in parsley. Yield. 3 or 4 servings.

Tomato Madrilene

Procedure: Follow directions for jellied consommé (above), substituting 1 cup tomato juice cocktail for 1 cup stock or consommé. If a highly seasoned madrilene is desired,



Fig. 134 Gelatin is a good stretcher for low caloric foods in salads, entrées and desserts.

add Worcestershire sauce and Tabasco to taste. Serve sprinkled with finely cut Pascal celery or green pepper. Place wedge of lemon on side of plate.

Milk-Vegetable Soup

Ingredients:

- 2 slices onion
- 1 small stalk celery
- 1 small carrot
- 1 cup skim milk
- Salt
- Paprika
- Chives or parsley

Procedure: Peel, slice and chop onion. Chop celery. Scrape and chop carrot. Combine with milk in top of double boiler and cook about 15 minutes until vegetables are tender. Season to taste and serve sprinkled with minced chives or parsley. Yield: 1 serving.

Meats

Roasting and broiling are the easiest methods to use for cooking meat when calories must be limited. Roasting should be done on a rack, as, in this way, most of the fat will drip into the bottom of the pan. Extra fat may be trimmed after the meat is sliced and before it is served. Broiling is, of course, always done on a rack. However, pan-broiling calls for a skillet. Sprinkle skillet surface with salt by means of a shaker. In the case of veal, rub surface lightly with fat before adding salt. If fat accumulates in the pan, it should be poured off during the cooking. When cooking has been completed, the meat should be placed on a paper towel and turned so that extra fat will be absorbed before it is served. For hamburg cakes, lean beef should be ground espe-

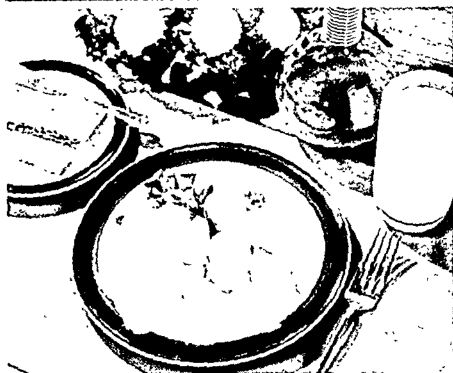


Fig. 133. A satisfying luncheon that is low in calories.

usual allowance for 1 cup of unsweetened liquid is ¼ gr. saccharin tablet or ½ Gm. Sucaryl tablet or ⅛ teaspoon Sucaryl solution.

Soups

Soups made from meat stock, strained, [illegible] canned bouillon or [illegible]

[illegible] with tomato juice and savory seasonings [illegible] served in liquid form or jellied.

[illegible]

with either a [illegible] milk vegetable soup made without stock, while higher in caloric count, will be much lower than a cream soup.

Jellied Consommé

Ingredients:

- 1 envelope unflavored gelatin
- 2 cups well-seasoned soup stock or consommé
- *Sliced lemon*
- Minced parsley

Procedure: Soften gelatin in ¼ cup stock. Heat remainder of stock and stir into gelatin. Chill When set, beat lightly with a fork and serve in soup cups. Serve each with slice of lemon dipped in parsley. Yield: 3 or 4 servings.

Tomato Madrilene

Procedure: Follow directions for jellied consommé (above), substituting 1 cup tomato juice cocktail for 1 cup stock or consommé If a highly seasoned madrilene is desired,

2 cups canned tomatoes
1 tablespoon tarragon vinegar
1 teaspoon Sucaryl solution
1 teaspoon salt
1 teaspoon paprika

Procedure: Trim crusts from bread. Cut

cups

Buttermilk or Yoghurt Dressing

Ingredients
1 cup buttermilk or yoghurt
1 tablespoon minced onion
1 tablespoon minced green pepper
1 tablespoon minced celery
1 tablespoon catsup
1 tablespoon herb vinegar
Salt to taste

Procedure: Mix ingredients thoroughly and let stand 1 hour or more to ripen flavor. A peeled clove of garlic may be placed in the dressing and removed before dressing is used. The use of yoghurt produces a thicker dressing. Yield: About 1 cup.

Cooked Dressing

Ingredients
½ envelope unflavored gelatin
2 tablespoons cold water
½ cup boiling water
¼ cup vinegar
1 teaspoon mustard
1 teaspoon salt
1 teaspoon paprika
1 egg, beaten

Procedure: Soften gelatin in cold water. Dissolve with boiling water and add vinegar. Mix seasonings and stir into beaten egg. Add hot liquid slowly and stir over low heat until mixture begins to thicken. Chill thoroughly and beat before serving. Yield: About 1½ cups.

Zero Salad Dressing

(May be used in any amount)

Ingredients
½ cup tomato juice
2 tablespoons lemon juice or vinegar
1 tablespoon onion, finely chopped
Salt and pepper
Chopped parsley or green pepper, horse-radish or mustard, etc., may be added, if desired.

Procedure: Combine ingredients in a jar with a tightly fitted top. Shake well before using.

Desserts

In a reducing diet, fresh fruits are the usual choice for dessert. Frozen fruits are packed in a syrup, but this is very light.

When milk is a dessert ingredient, fresh skim milk or reconstituted dry milk may be used. Jellied desserts and low caloric custards may be made with fresh skim milk or with reconstituted dry milk. They may be sweetened with Sucaryl.

Sucaryl, available both in tablet and liquid form, may be used as sweetening. The latter is convenient, as the tablets

Saccharin, the first of the artificial sweeteners, when used in a recipe may give the product a slightly bitter taste.

Both Sucaryl and saccharin tablets, easily carried in a small container, have their largest use as a sweetener for coffee and tea. They dissolve quickly in a hot beverage.

Most of the recipes suitable for a reducing diet are appropriate for use in a diabetic diet.

Most of the recipes will provide 4 servings, as these desserts keep well in the refrigerator and can be varied by serving with different fruits. The recipes can, of course, be halved if desired.

Blanc Mange

Ingredients:
1 envelope unflavored gelatin
¼ cup cold skim milk
2 teaspoons Sucaryl solution
⅛ teaspoon salt
1½ cups scalded skim milk
1 teaspoon vanilla or mint extract

Procedure: Soak gelatin in cold milk 5 minutes. Add Sucaryl and salt to scalded milk

cially, as normal hamburg contains a comparatively large amount of fat.

Braising is a method used for less tender cuts of meat. The meat should be browned according to directions for broiling, after which liquid is added. A stew for which the meat is cut in pieces calls for the same initial preparation. If *fat accumulates in the liquid during* the long cooking, the meat should be drained, the liquid chilled and the hardened fat skimmed The meat then may be reheated in the remaining liquid

Leftover cooked meat may be combined with vegetables and well-seasoned gelatin mixture. *See* jellied fish salad on this page

Fish

The best methods for cooking fish for a low caloric diet are "poaching" (simmering gently in water in a covered utensil) and baking in greased foil. Fish also may be broiled on a greased broiler rack if the fish is sprinkled lightly with milk or tomato juice. Frying is impractical without the use of a generous amount of fat Poached fish (*see* above) may be used to advantage in a jellied salad. "Dietetic Tuna" packed in brine is useful in a low caloric diet.

Baked Fish in Foil

Procedure: Grease pieces of foil about 3 times the size of fish fillet. Season fillet. Place on foil and fold over fillet Press edges together to seal tightly. Bake in hot oven (450° F) about 25 minutes

Jellied Fish Salad

Ingredients:
- 1 envelope unflavored gelatin
- ¼ cup cold water
- 1¾ cups boiling water
- *½ teaspoon salt*
- 1 drop Sucaryl solution
- 3 tablespoons vinegar
- 1 8-ounce can tuna fish, flaked
- ¼ green pepper, minced
- ½ small onion, minced
- 2 stalks celery, minced

Procedure: Soften *gelatin in ¼ cup cold* water Add boiling water, salt and Sucaryl, and stir until gelatin is dissolved Add vinegar Cool When jelly is nearly set, stir [illegible]

cooked meat or chicken may be substituted for the tuna fish

Vegetables

Special care must be taken in cooking vegetables so as to retain all their natural flavors (*see* Chap. 45). They must be particularly well seasoned, as the use of butter as a dressing must be limited Minced parsley, chives or sweet onion, minced celery or green pepper often is a welcome addition. Tomatoes may be used in combination with certain vegetables.

Salads

Salads have a valuable place in a reducing diet. Such large portions of vegetables and fruit salads may be used that a limited meal will appear to be more satisfying as well as actually to be so. The occasional use of an "aspic base" for fruits or vegetables, or a combination of both, is recommended. Cottage cheese also may be put to good use in salads. Although salad oil in dressings must be avoided or limited in content, there are a number of savory dressings that can be prepared without its use

Spicy Salad Dressing

Ingredients:
- 1 medium celery stalk
- ½ green pepper, seeded
- 1 small onion, peeled
- 1 teaspoon salt
- 1 teaspoon Sucaryl solution
- ½ cup vinegar
- 1 drop Tabasco

Procedure: Grind vegetables together Add salt and Sucaryl to vinegar Add Tabasco Combine with vegetables. Yield. About ½ cup

Tomato Dressing

Ingredients.
- *1 slice soft bread*
- 1 clove garlic, peeled

Pineapple Gelatin

(1 serving equals 1 fruit from List 3)

Ingredients.
- 1 teaspoon unflavored gelatin
- ¾ cup of water
- 1 tablespoon lemon juice
- ⅓ cup pineapple juice

Procedure. As for Lemon Gelatin

Fruit Gelatin I

(1 serving equals 1 fruit from List 3)

One serving of any fruit from List 3 may be added to lemon gelatin, such as ½ small banana

Fruit Gelatin II

(1 serving equals 2 fruits from List 3)

One serving of any fruit from List 3 may be added to orange or pineapple gelatin

Fruit Ice

(1 serving equals 1 fruit from List 3)

Ingredients
- ½ cup orange juice or ⅓ cup pineapple juice
- 1 tablespoon lemon juice
- 1 egg white
- ½ cup water

[illegible]

Fresh Fruit Cup

(1 serving equals 1 fruit from List 3)

Any fruits in List 3 may be combined to make a fruit cup One half cup of mixed fruits equals 1 serving Example:
- Orange grapefruit, pineapple
- Apple, grapefruit, strawberries
- Peach, orange, blackberries
- Grapes, orange, melon
- Melon, grapefruit, banana

Baked Custard

(1 serving equals ½ cup milk and 1 Meat Exchange)

Ingredients
- 1 egg
- ½ cup milk
- Few grains salt
- ⅛ teaspoon Sucaryl solution
- Sprinkle of nutmeg

Procedure Beat the egg slightly, stir in milk, salt, Sucaryl solution and vanilla. Pour

[illegible]

orange or maple may be used in place of vanilla)

Cheese Fondue

(1 serving equals 1 Bread Exchange and 2 Meat Exchanges and 1 cup milk)

Ingredients.
- 1 egg
- 1 cup milk
- 1 slice bread, cubed
- ¼ cup cheese, diced (1 oz)
- Salt, pepper, chopped parsley and onion

Procedure. Beat the egg, add milk, bread, cheese and seasoning Bake in a moderate oven (350° F) until firm in the center, about 20 or 30 minutes

In place of cheese, ¼ cup (1 oz.) of chopped ham, chicken, tuna fish or salmon may be used.

Meat Stew

(1 serving equals 2 or 3 Meat Exchanges and 1 Bread Exchange and 1 serving vegetable from List 2B and 1 Fat Exchange)

Ingredients·
- 1 teaspoon fat
- ½ cup mixed vegetables, list 2B (carrots, peas, onions)
- 2 or 3 ozs meat, cubed
- 1 small potato
- Salt and pepper to taste

Procedure: Brown meat in fat. Add 1 cup water, salt, pepper and a few celery leaves for seasoning Simmer slowly until meat is tender Add ½ cup vegetables, List 2B, and [illegible]

Baked Chicken and Rice

(1 serving equals 1 Bread Exchange and 1 or 2 Meat Exchanges)

Ingredients·

[illegible]

and stir until thoroughly dissolved. Add to softened gelatin and stir until thoroughly dissolved. Chill until as thick as unbeaten egg white Add flavoring and beat until

Yield, 4 servings

Baked Custard

Ingredients:

- 2 teaspoons Sucaryl solution
- ½ teaspoon salt
- 3 cups scalded skim milk
- 3 eggs
- 1 teaspoon vanilla extract
- Nutmeg

Procedure: Add Sucaryl and salt to scalded milk and stir until thoroughly dissolved. Beat eggs until yolks and whites are blended thoroughly and stir in the hot milk

are done. Remove from hot water at once and chill Nutmeg may be sprinkled over the custards before or after baking

Applesauce

Procedure· Wash apples. Halve and remove blossom ends. Slice without paring Place in saucepan with water enough to cover Cover saucepan and cook until apple pulp is soft Rub through coarse sieve Measure pulp To 1 pint strained pulp add 1 teaspoon or more Sucaryl solution to taste Beat thoroughly to dissolve and add salt to taste. Cinnamon or nutmeg to taste also may be added

Lemon Jelly

Ingredients:

- 1 envelope unflavored gelatin
- 2 cups cold water
- Rind of ½ lemon
- 1 tablespoon Sucaryl solution
- ¼ teaspoon salt
- 4 tablespoons lemon juice

Procedure: Soften gelatin in ½ cup cold water. Place remaining water in saucepan and add lemon rind. Bring to boiling and remove rind. Add Sucaryl and salt; stir until thoroughly dissolved. Add to gelatin and stir until dissolved. Add lemon juice. Pour into serving dish or mold and chill until set. Yield. 4 servings.

Jellied Grape Juice

Ingredients:

- 1 envelope unflavored gelatin
- ¼ cup cold water
- ½ cup boiling water
- ⅛ teaspoon Sucaryl solution
- ⅛ teaspoon salt
- 1 cup reconstituted frozen grape juice

DIABETIC RECIPES

Although, for the most part, diabetics can choose their diets from the foods on the family menu, there are times when so-called "mixed" dishes add desirable variety. The following recipes are based on the material included in the chapter on diabetes Their source is the pamphlet *Meal Planning and Exchange Lists* prepared by and available from The American Dietetic Association.

Lemon Gelatin

(May be used in any amount)

Ingredients:

- 1 teaspoon unflavored gelatin
- 2 tablespoons cold water
- 1 tablespoon lemon juice
- ½ cup water

Procedure· Put cold water in top of double boiler, add gelatin, let stand 10 minutes at room temperature. Place pan over boiling water to dissolve gelatin If desired, Sucaryl solution to flavor may be added Remove from stove. Add lemon juice and ½ cup of water Chill To make Coffee Gelatin omit lemon juice and use ½ cup coffee in place of ½ cup of water.

Orange Gelatin

(1 serving equals 1 fruit from List 3)

Procedure: Use ½ cup orange juice in place of water in recipe for lemon gelatin.

Pineapple Gelatin
(1 serving equals 1 fruit from List 3)

Ingredients·
- 1 teaspoon unflavored gelatin
- ¼ cup of water
- 1 tablespoon lemon juice
- ⅓ cup pineapple juice

Procedure· As for Lemon Gelatin

Fruit Gelatin I
(1 serving equals 1 fruit from List 3)

One serving of any fruit from List 3 may be added to lemon gelatin, such as ½ small banana

Fruit Gelatin II
(1 serving equals 2 fruits from List 3)

One serving of any fruit from List 3 may be added to orange or pineapple gelatin.

Fruit Ice
(1 serving equals 1 fruit from List 3)

Ingredients·
- ½ cup orange juice or ⅓ cup pineapple juice
- 1 tablespoon lemon juice
- 1 egg white
- ½ cup water

Procedure Combine fruit juice and water, freeze Stir mixture often while it is freezing When almost hard, fold in one stiffly beaten egg white

Fresh Fruit Cup
(1 serving equals 1 fruit from List 3)

Any fruits in List 3 may be combined to make a fruit cup One half cup of mixed fruits equals 1 serving Example
- Orange grapefruit, pineapple
- Apple, grapefruit, strawberries
- Peach, orange, blackberries
- Grapes, orange, melon
- Melon, grapefruit, banana

Baked Custard
(1 serving equals ½ cup milk and 1 Meat Exchange)

Ingredients:
- 1 egg
- ½ cup milk
- Few grains salt

[illegible]

into a custard cup and sprinkle with nutmeg Set in pan of hot water and bake in a moderate oven (350° F.) for about 45 minutes (Other flavors such as almond, lemon, orange or maple may be used in place of vanilla)

Cheese Fondue
(1 serving equals 1 Bread Exchange and 2 Meat Exchanges and 1 cup milk)

Ingredients·
- 1 egg
- 1 cup milk
- 1 slice bread, cubed
- ¼ cup cheese, diced (1 oz.)
- [illegible]

[illegible]

In place of cheese, ¼ cup (1 oz) of chopped ham, chicken, tuna fish or salmon may be used

Meat Stew
(1 serving equals 2 or 3 Meat Exchanges and 1 Bread Exchange and 1 serving vegetable from List 2B and 1 Fat Exchange)

Ingredients
- 1 teaspoon fat
- ½ cup mixed vegetables, list 2B (carrots, peas, onions)
- 2 or 3 ozs meat, cubed
- 1 small potato
- Salt and pepper to taste

Procedure· Brown meat in fat Add 1 cup water, salt, pepper and a few celery leaves for seasoning Simmer slowly until meat is tender Add ½ cup vegetables, List 2B, and [illegible]

Baked Chicken and Rice
(1 serving equals 1 Bread Exchange and 1 or 2 Meat Exchanges)

Ingredients
- ½ cup cooked rice
- ¼ or ½ cup diced chicken (1 or 2 ozs)
- ½ cup clear broth
- Salt and pepper
- Chopped parsley, onions, celery, mushrooms, green pepper, pimiento or tomatoes may be added for variety, if desired.

Procedure· Combine the above ingredients

and place in dish Bake in a moderate oven until brown

Noodles or spaghetti may be used in place of rice For the chicken, any type of meat or fish, such as lamb, ham, tuna or shrimp, may be used

Fish Chowder

(1 serving equals 1 Fat Exchange and 1 Bread Exchange and 1 or 2 Meat Exchanges and 1 cup milk)

Ingredients:

1 teaspoon fat
½ small onion, chopped
1 small potato, sliced
¼ or ½ cup cooked fish (1 or 2 ozs.)
1 cup milk
Salt and pepper

Procedure. Cook fish in salted water. Melt fat in saucepan, brown the onion Add cooked fish, sliced potato, ½ cup water in which fish was cooked. Cover and cook for 15 minutes until potatoes are tender Add milk and seasonings

Vegetable Soup

(1 serving equals 1 vegetable from List 2B)

Ingredients

1 cup meat stock or bouillon cube and 1 cup water
½ cup mixed vegetables carrots, peas
½ small onion, chopped
¼ cup cabbage, shredded
1 stalk celery, diced
¼ cup tomato juice

Potato Salad I

(1 serving equals 1 Bread Exchange)

Ingredients:

½ cup cooked potato, diced
1 or 2 tablespoons Zero salad dressing
Salt, pepper, chopped onion, celery, parsley, green pepper, as desired

Procedure. Combine ingredients and serve

Potato Salad II

(1 serving equals 1 Fat Exchange and 1 Bread Exchange)

Ingredients.

Use recipe for Potato Salad I except that 1 teaspoon of mayonnaise may be used in place of Zero salad dressing

Potato Salad III

(1 serving equals 1 Bread Exchange and 1 Meat Exchange and 1 Fat Exchange, if desired)

Ingredients:

1 hard-cooked egg, sliced, may be added to recipe for Potato Salad I or II
¼ cup (1 oz.) diced ham, bologna or frankfurter or 5 small shrimps may be used in place of egg.

Zero Salad Dressing

See under Low Caloric Recipes

Italian Spaghetti

(1 serving equals 1 or 2 Meat Exchanges and 1 or 2 Bread Exchanges and 1 Fat Exchange)

Ingredients

1 teaspoon fat
½ small onion, chopped
2 tablespoons tomato paste
½ cup water
Salt, pepper
½ cup tomatoes
1 or 2 ozs ground meat

more if needed, add more water Serve on ½ or 1 cup cooked spaghetti One or 2 teaspoons grated cheese may be used.

Macaroni and Cheese

(1 serving equals 1 Bread Exhange and 1 or 2 Meat Exchanges and ½ cup milk)

Ingredients:

½ cup cooked macaroni
¼ or ½ cup diced cheese (1 or 2 ozs.)
½ cup milk
Salt, pepper, dash of mustard

Procedure. Cook cheese and milk togeth in double boiler until smooth Add macaro and mix well Bake in moderate oven abo 20 minutes or until brown

In place of macaroni, ½ cup cooked ric noodles or spaghetti may be used.

Mixed Vegetable Salad

(May be used in any amount)

Ingredients.

Any combination of vegetables from Lis 2A may be used, such as:

1 Lettuce, cucumber, celery, greer pepper



Fig 135. A hearty breakfast orange juice, egg, toast, coffee and milk

2. Chicory, tomato, radish
3. Lettuce, parsley, raw cauliflower, tomato
4. Escarole, tomato, cucumber
5. Cabbage, celery, green pepper
6. Lettuce, watercress, cucumber
7. Lettuce, raw spinach, radish

Procedure: Salad may be combined with Zero salad dressing, French dressing or mayonnaise, depending upon fat allowed in the meal plan

HIGH CALORIC, HIGH PROTEIN RECIPES

There are a good many ways in which the calorie or the protein content, either of a beverage or a dish, may be increased For convenience, some h‑gh prote

To Increase Calories

1. *Use lactose* in addition to sugar Beta lactose is preferable to ordinary lactose, as it may be stirred directly into the recipe instead of having to be dissolved in hot water before being added

2 Replace part of the milk with cream or evaporated milk.

3 Add a ball of ice cream to any milk or fruit drink, ginger ale or root beer.

4 If an electric blender is available, any fresh, canned or soaked dried fruit may be combined with milk.

To Increase the Protein Content

1 Beat 1 or 2 tablespoons of dry milk into the fresh milk to be used for a recipe by sprinkling the dry milk over the fluid milk in a bowl and beating with a rotary egg beater until completely blended.



Fig. 136 Protein may be increased by the use of extra dry skim milk in desserts and cookies.

2. Use 2 eggs instead of 1 in recipes which call for eggs, or add 1 well-beaten egg to any cold beverage made with milk.

3 Add 1 or 2 tablespoons of one of the many protein supplements which are manufactured by a number of drug and chemical companies. Some of these are low in sodium, which may be of advantage when a high protein, low sodium diet is desired Suggestions for the addition of these will be found in the pamphlets which accompany the products.

4. Add gelatin to hot broth, diluted condensed soups or homemade soups

5. Add egg whites to fruit juices.

Consommé with Gelatin

Ingredients:

¾ cup cold consommé or ¾ cup water and 1 bouillon cube
1 envelope unflavored gelatin

Procedure: Add consommé or water and bouillon cube to gelatin in saucepan. Stir constantly over low heat until gelatin is dissolved and bring almost to boiling. Yield 1 generous serving

Condensed Soup with Gelatin

Ingredients.

1 can condensed soup
2 envelopes unflavored gelatin
1½ cups milk

Procedure: Place contents of can of condensed soup in saucepan Soak gelatin in ½ cup milk Add remaining milk to condensed soup and heat Add softened gelatin and stir constantly over low heat until gelatin is dissolved Bring almost to boiling and serve at once Or pour into soup cups and chill until set Or pour into small molds and, when set, turn out and serve with salad greens Yield 3 to 4 servings

Fruit or Vegetable Juice with Gelatin

Procedure In top of small double boiler, soften 1 envelope unflavored gelatin in ¼

cup cold fruit or vegetable juice. Stir over boiling water until gelatin is thoroughly dissolved Add % cup of chilled fruit or vegetable juice

High Caloric, High Protein Feeding

Ingredients:
- 1 pint milk
- % cup nonfat dry milk
- 2 eggs
- 1 pint ice cream
- Vanilla or other flavoring to taste

Procedure. Add milk to dry milk to make a smooth paste. Beat in eggs Add ice cream and flavoring and mix well. Yield. 6 generous servings

High Caloric Fruitade

Ingredients
- 1 tablespoon sugar
- 3 tablespoons beta lactose
- 1 tablespoon lemon juice
- % cup orange juice or pineapple juice

Procedure Add sugar to lactose and fruit juices. Mix thoroughly, chill and serve. Yield 1 serving

Ginger-Ale Ice-Cream Soda

Ingredients:
- % cup vanilla ice cream
- 1 small bottle ginger ale

Procedure Put ice cream in a tall glass and pour half the ginger ale over it. Stir until well mixed, then add the remainder of the ginger ale Serve at once Yield 1 serving

NOTE Root beer may replace ginger ale

High Caloric Chocolate Milk Shake

Ingredients:
- 3 tablespoons beta lactose
- 1% tablespoons cocoa syrup
- 2 tablespoons heavy cream
- % cup milk

Procedure: Mix lactose, syrup, cream and milk Beat with rotary egg beater until slightly foamy Yield 1 serving

High Caloric Eggnog

Ingredients.
- 1 egg
- 3 tablespoons beta lactose
- % cup milk
- 2 tablespoons cream
- % teaspoon vanilla

Procedure Beat egg and add lactose, milk, cream and vanilla. Mix thoroughly, chill and serve. Yield. 1 serving

High Caloric Custard

Ingredients:
- 2 tablespoons sugar
- 4 tablespoons beta lactose
- 1 cup thin cream
- 1 egg
- % teaspoon salt
- % teaspoon vanilla
- Nutmeg

Procedure Add sugar and lact[illegible]

High Protein Custard

Procedure: In above recipe substitute milk for cream and increase eggs to 2.

High Caloric Cereal Gruel I

Ingredients.
- % cup farina
- % teaspoon salt
- 2 cups boiling water
- 1% cups hot milk
- 6 tablespoons beta lactose

Procedure. Add farina slowly to salted boiling water and cook over direct heat until thickened. Cook over water for % hour Add hot milk and lactose Yield: 6 servings.

High Caloric Cereal Gruel II

Ingredients:
- 2 tablespoons pearl barley or oatmeal
- % teaspoon salt
- 1 cup water
- 2 tablespoons beta lactose
- % cup cream
- Sugar or additional salt to taste

Procedure. Add barley or oatmeal slowly to salted boiling water and simmer slowly for 1 hour over direct flame Strain the liquid into another pan, add lactose and cream and sugar or salt to taste, reheat and serve. Yield 1 or 2 servings

Protein Fruitade

Ingredients.
- 2 tablespoons Protinal*
- 1 cup fruit juice

* National Drug Company.

Procedure: Make a paste of the Protinal with a small amount of fruit juice. Add remaining fruit juice and chill Stir or shake well before serving Yield: 1 generous or 2 medium servings

Fruit Juice with Egg White

Ingredients:
- 1 egg white
- ⅓ cup fruit juice (tomato, orange, pineapple or grape juice, etc.)

Procedure: Cut egg white with 2 knives. Add fruit juice and beat just enough to blend Avoid beating to a froth Yield: 1 serving

Ginger Ale, Grape Juice with Egg White

Ingredients:
- 2 egg whites
- [illegible]

[illegible] just enough to blend Yield. 1 generous serving or 2 medium

Lemonade with Egg White

Ingredients:
- 4 teaspoons dextrose
- Hot water
- ¾ cup cold water
- 2 tablespoons lemon juice
- 1 egg white

Procedure: Dissolve dextrose in a little hot [illegible]

High Protein Milk Shake

Ingredients:
- ⅔ cup Protinal
- 1 tablespoon sugar
- 1 cup milk
- [illegible]

[illegible]

Yield. 1 serving

Note Lonalac* may be substituted for the milk to make this beverage low in sodium Lactose may be added for extra calories.

* Mead Johnson Co

High Caloric, High Protein, Low Sodium Eggnog

Ingredients:
- 100 Gm. beta lactose
- 7 eggs
- 500 Gm Lonalac (dry)
- 500 cc. 18 per cent cream
- Water to make up to 2,000 cc.

Procedure: Place in rotary mixer and mix until well blended. Yield: 8-10 servings.

High Protein Eggnog

Ingredients:
- 1 egg white
- 2½ tablespoons dry skim milk
- 1 egg yolk
- 1 tablespoon dextrose or sugar
- ¾ cup milk
- Vanilla
- Nutmeg

Procedure [illegible]

High Protein Malted Milk

Ingredients:
- 2 egg whites
- 3 tablespoons malted milk powder
- [illegible]

[illegible]

High Protein Milk

Ingredients:
- 2 egg whites
- 4 tablespoons dry skim milk
- ⅓ cup milk
- [illegible]

[illegible] Add milk, sugar and flavoring to taste Blend well Yield 1 generous serving

High Protein, Low Sodium Beverage

Ingredients:
- 1 cup Lonalac (dry)
- ¼ cup sugar
- 1 quart water
- 1¼ cups Protinal



Fig 137 Bran muffins ready for serving

Procedure Make a thin paste of the Lonalac, sugar and part of the water Add the remainder of the water and beat with a rotary egg beater until smooth To 2 cups of the liquid Lonalac gradually add the Protinal by sprinkling it on top and beating until smooth Add the remainder of the liquid Lonalac and beat. Chill. Stir well before using Do not warm. Yield 5 or 6 servings

Variation Fruit juice may be used in place of Lonalac This will change the protein but not the sodium content.

NOTE There is a variety of low sodium, high protein beverages on the market, any of which may be used as above

ALLERGY RECIPES

The preparation of food for a patient with allergy may be a real problem, especially when the more common types of food produce allergic symptoms. It is not too difficult to eliminate fish, shellfish and certain vegetables and fruits, but when the offenders are milk, eggs

and wheat—all of which are used in the preparation of everyday meals—meal planning and preparation call for constant consideration. When the allergy is to milk alone, water may be substituted for milk in any standard recipe. When [illegible]

made from other grains or from potatoes can be used in certain recipes, few of which, however, are as satisfactory as when standard wheat flour is used. The crisp rye wafers that are obtainable in every grocery store are used largely for patients allergic to milk, wheat and eggs, as they are free of all of these

For thickening sauces and gravies, cornstarch may be substituted for flour, half as much as the standard proportion being used. Ready-to-eat cereals such as cornflakes or crisp rice cereal may replace bread and cracked crumbs for toppings and for coating foods for frying. They may also be used in combination with fruits for baked desserts and for pie shells.

Combinations of Flour To Be Used in Place of 1 Cup Wheat Flour

1	Rye flour		⅝ cup
	Potato flour		⅜ cup
2.	Rye flour		⅔ cup
	Potato flour		⅓ cup
3	Rice flour	(10 tbsp.)	⅝ cup
	Rye flour		⅓ cup
4	Soy flour		1 cup
	Potato starch flour		¾ cup

When substitutes for wheat flour are used, the resulting products cannot be scored by the standards used for breads made with wheat flour alone, especially when eggs must be omitted It is sometimes difficult to purchase flours other than wheat, and usually a "health store" is the only place where they can be found If possible, light-rye rather than whole-rye flour should be chosen, as the whole-rye flour spoils rather quickly.

Corn meal and ground rolled oats are two products which can be used to advantage, as they are always available and are generally acceptable.

When small quantities of various flours are to be combined and when coarse flours are used, it is not necessary to sift the flour before measuring, but combinations of flours should be thoroughly mixed and sifted with the other dry ingredients. Most muffins and biscuits have better texture when made in small sizes. If small muffin pans and biscuit cutters are not available, decrease the indicated oven temperatures by 25° and increase the baking time slightly for larger products.

Additional recipes, suitable for patients allergic to wheat only, will be found under Gluten-Free Recipes.

For further information with regard to recipes for the allergic patient, the nurse is referred to "Allergy Recipes" published by The American Dietetic Association

In the following recipes the letters W-E-M denote the absence of wheat, eggs and milk, according to the initial or initials used.

Rye Bread (W-E-M)

Ingredients:

- 1 package or cake yeast, active dry or compressed
- 1½ cups water
- 2 tablespoons sugar
- 1½ teaspoons salt
- 2 tablespoons melted shortening
- 5 cups light-rye flour (approximately)

Procedure: Crumble compressed yeast or empty envelope of dry yeast into large bowl Add ½ cup water (warm for dry, lukewarm for compressed yeast) and 1 teaspoon sugar. Stir and let stand 5 minutes Add re- [illegible]

until smooth and elastic. Place in greased bowl, cover with a towel and let rise over hot water until double in bulk. Divide into

two parts and shape each on floured board, kneading until mixture can be shaped into a loaf. Place in greased bread pan and let rise until double Bake in a moderately hot oven (425° F.) until lightly browned (about 15 minutes) Lower temperature to 350° F. and continue baking about 30 minutes more

Rolled Oats Biscuits (W-E-M)

Ingredients:

- 2 cups finely ground rolled oats
- 1 teaspoon salt
- 3 teaspoons baking powder
- 3 tablespoons shortening
- ½ to ¾ cup water

Procedure. Mix ground oats thoroughly with salt and baking powder Cut in or rub in shortening until mixture is as fine as coarse corn meal Stir in enough water to make a stiff dough Pat out and cut into rounds For a drop biscuit, add more water and drop by tablespoonfuls on baking sheet Bake in hot oven (450° F) from 10 to 12 minutes Yield 12 small biscuits

NOTE 1 cup light-rye flour may replace 1 cup ground rolled oats

Rye and Corn-Meal Muffins (W-E-M)

Ingredients:

- ½ cup light-rye flour
- ½ cup corn meal
- 3 teaspoons baking powder
- 1 tablespoon sugar
- ½ teaspoon salt
- ½ cup water
- 1 tablespoon melted shortening

Procedure: Sift dry ingredients together Stir in water and shortening, continue stirring until blended Bake in well-greased muffin tins in moderately hot oven (400° F) from 20 to 25 minutes Yield 6 small muffins

Old-fashioned Johnnycakes (W-E-M)

Ingredients

- 1 tablespoon bacon drippings
- ½ cup boiling water
- ½ cup corn meal
- ½ teaspoon salt
- 1 tablespoon sugar

Procedure: Add shortening to boiling water Stir in corn meal, salt and sugar and stir over low heat until mixture thickens Drop by tablespoonfuls on preheated well-greased griddle and bake until lightly browned on both sides Lower heat under griddle and bake 5 minutes more, turning often Yield 6-8 cakes

Crisp Corn Pone (W-E-M)

Procedure. Prepare batter for Old-fashioned Johnnycakes Spread mixture on well-greased 9-inch pie pan Dot with butter or margarine and bake in moderately hot oven (450° F) 20 minutes Place under heat of preheated broiler about 5 minutes until lightly browned Cut in pie-shaped pieces and serve with butter or gravy

Butterscotch Wafers (W-M)

Ingredients

- ½ cup unsifted rye flour
- ½ teaspoon baking powder
- ¼ teaspoon salt
- ¼ cup shortening
- 1 cup brown sugar, firmly packed
- 1 egg, well beaten
- ½ cup chopped nut meats

Procedure: Mix flour, baking powder and salt Melt shortening, stir in sugar and mix well Remove from heat and stir in well-beaten eggs Stir in sifted dry ingredients to which nut meats have been added Drop by ½ teaspoonfuls on greased baking sheet and bake in slow oven (325° F) about 15 minutes Cool slightly, then remove carefully with a thin knife or spatula If cookies harden on sheet, return to the oven for a few minutes Yield about 3½ dozen cookies 2 inches in diameter

Quick Chocolate Drops (W-E)

Ingredients

- 2 *squares chocolate, melted*
- 1⅓ cups (14½-oz can) sweetened con*densed milk*
- 2 cups chopped nut meats or 3 cups *shredded coconut*

Procedure: Blend melted chocolate with condensed milk Stir in chopped nut meats or coconut and mix well Drop by teaspoonfuls on greased baking sheet and bake in moderate oven (350° F) from 15 to 20 minutes Yield 4 dozen cookies 1 inch in diameter

NOTE *This recipe may be halved if there* is some other use for the condensed milk These cookies keep indefinitely, however, and it may be more practical to make up the entire recipe

Rice Krispies Marshmallow Squares (W-E-M)

Ingredients:

¼ cup vegetable shortening
½ lb eggless marshmallows (about 2½ dozen)
½ teaspoon vanilla
1 package crisp rice cereal (5½ ozs.)

Procedure: Cook shortening and marshmallows in double boiler (about 30 minutes). Add vanilla and beat thoroughly to blend. Put Rice Krispies in large greased bowl and pour on marshmallow mixture, stirring briskly. Press into shallow greased pan Cut into squares when cool. Yield· 32 2-inch squares.

Meringues (W-M)

Ingredients:

1 egg white
¼ cup sugar
Dash salt
½ teaspoon vanilla

Procedure: Beat the egg white until stiff and dry Beat in gradually half the sugar and the salt Fold in remaining sugar and vanilla extract Drop meringues by tablespoonfuls on ungreased baking sheet, piling mixture high in center. Bake in slow oven (275° F) from about 40 to 45 minutes

Apple Tapioca (W-E-M)

Ingredients·

½ teaspoon salt
¼ teaspoon nutmeg
¼ teaspoon cinnamon

Procedure: Pare, core and slice apples Put into greased 8-inch baking dish. Add boil-

cover and stir in a mixture of ½ cup of the sugar, tapioca, salt and spices Mix thoroughly Bake, uncovered, 5 minutes longer, then stir mixture well Sprinkle top with remaining sugar and dot with remaining ½ tablespoon butter. Bake 10 minutes longer, or until tapioca is clear Serve warm or cold. Yield· 4 servings

Apple Strudel (W-E-M)

Ingredients·

5 cups cornflakes
3 cups sliced apples
¾ cup sugar, granulated or brown
Cinnamon
3 tablespoons butter or margarine

Procedure: Put layer of cornflakes in greased 1½-quart casserole Cover with layer of apples Add half the sugar, sprinkle with cinnamon and dot with one third of the butter or the margarine. Add another layer of cornflakes, remaining apples and sugar Sprinkle with cinnamon and dot with more butter or margarine. Put a layer of

cream Yield. 6 servings

NOTE· Add about 2 tablespoons water to strudel before baking if apples are not juicy. Sprinkle few drops lemon juice over apples if they are not tart.

Cream Sauce (W-E)

Ingredients:

1 tablespoon shortening
1 tablespoon cornstarch
¼ teaspoon salt
Few grains pepper
1 cup milk

Procedure: Melt shortening. Stir in cornstarch, salt and pepper Stir in milk. Stir

Rice Stuffing (W-E-M)

Ingredients:

½ cup rice
½ teaspoon salt
3 cups boiling water
½ cup diced celery
¼ cup diced onion
½ cup fat
5¼ cups (1 package) crisp rice cereal
2 tablespoons minced parsley

1 tablespoon poultry seasoning
½ teaspoon salt
⅝ cup stock or water

Procedure Wash rice thoroughly in a sieve and drain well. Add rice to boiling salted water slowly so that water continues to bubble Boil rapidly 15 to 20 minutes until rice is tender Drain in sieve. Brown celery and onion in fat Stir in rice and mix well Crush Rice Krispies into coarse crumbs. Add parsley, seasonings and stock Combine with rice and mix thoroughly Yield 5½ cups stuffing

NOTE Stuffing may be baked in a covered casserole in moderate oven (375° F) for 25 minutes.

KETOGENIC DIET

The ketogenic diet is extremely low in carbohydrate and must be carefully calculated for protein, fat and carbohydrate content. The usual types of bread are seldom permitted on this regimen The following recipe for muffins may have some use as a substitute

Bran-Soy Muffins

Ingredients:
15 Gm. Battle Creek cooked bran or White Rose cooked bran
25 Gm soy flour
½ teaspoon salt
⅛ teaspoon baking powder
23 Gm butter, sweet
½ cup water
2 egg yolks
2 egg whites, stiffly beaten

Procedure. Mix dry ingredients. Melt butter Add water and melted butter to the dry-ingredient mixture. Fold in egg yolks and stiffly beaten egg whites Bake in 12 small lightly greased muffin tins in moderately hot oven (425° F) 15 to 20 minutes Each muffin contains 0 1 Gm carbohydrate, 1 8 Gm protein and 3 Gm fat.

GLUTEN-FREE RECIPES

The "gluten-free" diet calls for the omission of all wheat and rye flours, oatmeal, barley and buckwheat. Corn meal, rice and rice flour and wheat starch may be used freely. The following recipes use the permitted flours only A few other suitable recipes will be found under Allergy Recipes

Guide for Substituting Rice Flour in Standard Recipes

1 Substitute ⅞ cup rice flour for 1 cup regular flour
2 More liquid (very small amount) may decrease graininess
3 Baking time may be slightly longer.

Gluten-Free Bread

Ingredients:
1 cup unsifted rice flour or 1½ cup gluten-free wheat starch (Cellu Products Co)
½ teaspoon salt
3 teaspoons baking powder
4 tablespoons vegetable shortening
4 tablespoons sugar
2 egg yolks
⅔ cup milk
2 egg whites, well beaten
1 ripe, medium size banana

Procedure Measure flour, baking powder and salt Combine and sift Cream softened shortening, then cream with sugar until well blended Stir in unbeaten egg yolks. Add flour alternately with the milk, beating after each addition Fold in the well-beaten egg whites Mash banana well and fold in mixture Spread batter into well-greased loaf pan (8 x 4 x 3 inches) Bake in preheated slow oven (325° F) about 45 minutes until crumb is dry when tested with toothpick If a browner loaf is desired, temperature may be raised to 450° F for the last 5 minutes of baking Remove bread from oven Let stand 5 minutes Loosen loaf with spatula and turn out on rack. Cool before slicing The banana may be omitted if desired

Rice Flour Muffins

Ingredients:
1 cup unsifted rice flour
¼ teaspoon salt
3 teaspoons baking powder
¼ cup vegetable shortening
⅓ cup sugar
2 egg yolks
½ cup milk
2 egg whites
⅛ teaspoon vanilla, lemon or almond flavoring

Procedure Measure rice flour, baking powder, salt and sift together twice. Cream softened shortening, add sugar and cream together Stir in egg yolks Add flour mixture alternately with milk, beating after

each addition. Fold in well beaten (but not dry) egg whites. Spoon into a well-greased muffin tin Bake 30 minutes in a 325° F. (moderate oven) or until lightly browned. Yield. 6 muffins.

Spoon Bread

Ingredients:

1 cup boiling water
⅓ cup white corn meal
½ cup milk
½ teaspoon salt
1½ teaspoons baking powder
1 tablespoon soft butter
2 eggs, well beaten

Procedure· Pour boiling water over corn meal Beat in milk, salt, baking powder, butter and eggs. Pour into buttered 1-quart casserole or baking dish Bake in 400° F. (moderately hot) oven 35-45 minutes or until just set Serve piping hot with butter. Yield 6 servings

Southern Corn Muffins

Ingredients.

1 cup boiling water
1 cup white corn meal
½ cup milk
½ teaspoon salt
2 teaspoons baking powder
1 tablespoon soft butter
1 egg, well beaten

Procedure· Pour boiling water over corn meal Beat in milk, salt, baking powder,

Baked Indian Pudding

Ingredients:

1 quart milk
1 cup yellow corn meal
1 teaspoon salt
¼ cup molasses
⅓ cup sugar
¼ teaspoon cinnamon
2 tablespoons butter

Procedure: Scald 3 cups of the milk, pour over corn meal to which salt has been

very slow oven (250°) 5 to 6 hours Serve hot or cold with whipped cream or ice cream

NOTE: The pudding is very thin when put in the oven. It will thicken and caramelize as it bakes. Yield: 6-8 servings.

Rice Flour Brownies

Ingredients

2 squares unsweetened chocolate (2 ozs)
½ cup shortening (margarine)
1 cup sugar
2 eggs
⅔ cup rice flour, sifted twice before measuring
½ teaspoon baking powder
½ teaspoon salt

Procedure: Melt chocolate and shortening

Spread into a greased 8 inch square pan.

squares Yield: 16 2-inch squares.

Rice Flour Sponge Cake

Ingredients

2 eggs, separated
⅓ cup sugar
¼ cup rice flour, sifted twice before measuring
1 teaspoon lemon juice
Grated rind of ¼ lemon
Dash of salt

Procedure· Sift together rice flour, sugar and salt Beat egg yolks until thick and lemon colored Add lemon juice and rind to egg yolks Beat egg whites until stiff but not dry Fold egg yolk mixture and flour mixture alternately in small amounts into beaten egg whites with rubber spatula. Pour into a small loaf pan that has been lined with wax paper Bake in a 350° (moderate) oven 25-30 minutes

Rice Flour Drop Cookies

Ingredients:

⅔ cup rice flour, sifted twice before measuring
½ teaspoon salt

1 teaspoon baking powder
½ cup shortening (margarine)
½ cup sugar
½ teaspoon vanilla
1 egg
2 tablespoons milk

Procedure. Sift together rice flour, salt and baking powder. Cream shortening until light and fluffy. Add sugar gradually, beating thoroughly. Add vanilla and egg, and beat until well combined. Add rice-flour mixture and milk alternately, beginning and ending with rice-flour mixture. Allow dough to stand ½ hour (preferably in the refrigerator) before baking. Drop by teaspoon on a greased cookie sheet. Bake in 375° oven 12-15 minutes. Remove from pan while hot and cool on a rack. Yield: 3 dozen cookies, thin brown edged.

LOW SODIUM RECIPES

When the physician has prescribed a low sodium diet, salt as a seasoning must be avoided completely. This applies not only to its use on the table and in cookery but also to the selection of processed or manufactured products such as canned and some frozen vegetables, salad dressings, meat sauces such as ketchup and chili sauce, with the exception of Tabasco sauce, and to bread and some cereals. Only canned foods and breads whose labels indicate that no salt or sodium compounds have been added should be chosen.

In order to make the diet more appetizing, it may be desirable to prepare certain homemade quick breads and perhaps cakes and cookies. If this is the case, a druggist can make up a low sodium baking powder according to the recipe included in this section. In the preparation of such foods only unsalted shortening may be used, and salt must be omitted.

Low Sodium Baking Powder

Potassium bicarbonate	39.8 Gm.
Cornstarch	28.0 Gm.
Tartaric acid	7.5 Gm.
Potassium bitartrate	56.1 Gm.

Substitute 1½ teaspoons low sodium baking powder for 1 teaspoon regular baking powder.

Cereals Processed Without Salt

Among cereals, those on the following list* are processed without salt. (No salt should be used in preparing the hot cereals.)

Barley
Corn meal, popped corn
Cracked wheat, wheat germ
Shredded wheat, puffed wheat
Wheatena, Wheatsworth
Cream of Wheat, regular
Oatmeal, regular
Farina, regular
Groats
Maltex
Pettijohns
Instant Ralston
Macaroni, spaghetti
Rice, puffed rice, wild rice

Spices and Herbs To Flavor Unsalted Foods

Cooked foods and salads may be made more palatable with the use of spices and herbs if these are low in sodium content. With the exception of products such as garlic, onion and celery salt, that are combinations of these condiments with salt, and of celery and parsley flakes, the majority of spices are low in sodium (see Table 5, Part Four).

Certain herbs and spices have been found to blend or contrast better than others with various foods. The following suggestions may be found useful.

Allspice: meat
Angostura bitters: sauces, meat
Anise: bread
Bay leaf: meat, soup, fish
Basil: salad, egg dishes, tomatoes
Caraway seed: meat, vegetables, cheese

* Bagker, R. R.: The Cook Book for Low Sodium Diet, The American Heart Association, Inc., 1950.

Celery seed: meat, vegetables, salad, soup
Chervil. salad, soup, fish sauces, egg dishes
Chili powder. meat, vegetables
Cloves: meat, fruits, desserts
Cumin: meat, vegetables
Curry (salt free): meat, vegetables
Dill: meat, fish, vegetables, soup
Garlic: meat, salad
Ginger: meat
Leeks: soup, meat
Mace: meat, sauces, cakes, sweets
Marjoram: meat, vegetables, salad, fruit
Mint. beverages, meat, confections, desserts
Mustard, dry. meat, fish, salad
Nutmeg cake, desserts
Onion. meat, salad, vegetables
Oregano meat, tomato sauce
Parsley salad, soup, meat, vegetables, garnish
Pepper meat, vegetables, salad, dressing
Poppy seeds· meat, macaroni products
Poultry seasoning· stuffings, meat
Rosemary. salad, meat, fish
Saffron. meat, fish, rice
Sage. poultry and fish stuffing
Tabasco * meat, vegetables, soup, salad dressing
Tarragon. salad, soup, meat
Thyme stuffing, soup, meat

A number of "salt substitutes" are available which owe their flavor to other mineral salts than sodium. The most ac- [illegible]

[illegible] used without permission of the physician

* Tabasco sauce contains 400 to 500 mg of sodium per 100 cc. The quantity used in a recipe is so small, however, that its contribution to the total sodium content of a dish is negligible.

Tomato Juice Cocktail (Unsalted)

Ingredients:
1 cup unsalted tomato juice
1 tablespoon lemon juice
1 teaspoon sugar
Celery seed
Minced onion

Procedure: Combine ingredients and chill. Shake or stir well before serving Yield: 2 servings.

Tomato Aspic (Uns.)

Ingredients:
2 cups unsalted tomato juice
1 bay leaf
4 whole cloves
1 slice onion
6 peppercorns
1 envelope unflavored gelatin
1 tablespoon lemon juice

Procedure: Measure 1¾ cups tomato juice into saucepan Add bay leaf, cloves, onion [illegible] into mold and chill until firm, serve as a basis for a salad. Or break up with fork before placing in soup cups. Yield: 4 servings

French Dressing (Uns.)

Ingredients:
¾ cup salad oil
½ teaspoon paprika
[illegible]

[illegible] Yield. ⅞ cup.

Variations:
1. Substitute grapefruit juice for the vinegar.
2 Add ¼ cup strained fresh tomato pulp [illegible]

Liver-Rice Loaf (Uns.)

Ingredients·
½ cup cooked unsalted rice
¾ cup chopped cooked unsalted liver

½ cup unsalted bread crumbs
1 egg yolk, well beaten
½ cup Lonalac
¼ teaspoon pepper
¼ teaspoon sage
½ tablespoon unsalted melted butter

Procedure Combine ingredients, except the butter Form into loaf and place in greased pan Pour melted butter over mixture Bake in slow oven (325° F) 1 hour Serve with unsalted tomato sauce Yield 3 servings

Meat Patty (Uns.)

Ingredients.
½ lb ground beef
2 teaspoons minced onion
¼ teaspoon dry mustard
Few grains pepper

Procedure: Combine all ingredients and form into 2 small patties Brown on both sides in a skillet lightly greased with unsalted fat Add a few drops of water and continue cooking, covered, until meat is done. Yield 2 servings

Veal Casserole (Uns.)

Ingredients
1 lb veal cutlet
Flour
Pepper
3 tablespoons olive oil
½ garlic, peeled
2 tomatoes, peeled and sliced
2 tablespoons flour
1 cup water
¼ teaspoon basil
1 tablespoon minced parsley

Procedure: Dredge meat with flour and pepper Heat oil and garlic Brown meat on both sides in the oil Remove garlic. Arrange tomatoes in casserole and arrange meat on top Stir 2 tablespoons flour into oil re- [illegible]

Savory Steak (Uns.)

Ingredients:
1 flank steak
Flour
Pepper
3 tablespoons unsalted fat
2 onions, peeled and sliced
1 small green pepper, seeded and sliced
1 bay leaf
3 cloves
2 tablespoons minced carrot
2 cups unsalted tomatoes
[illegible]

4 to 5 servings

Lamb Stew (Uns.)

Ingredients.
1½ lbs stewing lamb
Flour
Pepper
4 tablespoons unsalted fat
¼ cup sliced onions
1 bay leaf
1½ cups diced potatoes
½ cup diced carrots
½ cup diced turnips

Procedure Cut meat in 1½-inch cubes [illegible] with liquid 5 minutes before ready to serve. Sprinkle with minced parsley before serving Yield 4 to 5 servings.

Chicken Tabasco (Uns.)

Ingredients.
1 2-lb dressed broiler
½ lime or lemon
2 tablespoons melted unsalted butter
¼ teaspoon Tabasco
1 teaspoon sugar
Chopped parsley

Procedure Clean and wipe chicken dry. Rub surface of chicken with the cut lime or lemon, squeezing to keep the juice flowing Combine melted butter and Tabasco and brush chicken with the mixture. Sprinkle lightly with sugar Place in broiler pan, skin side down. Broil for 10 minutes as far from the heat as possible. Raise chicken to 4 inches from heat and turn

Brown Beef Stew (Uns.)

Ingredients:
- 2 lbs lean beef (boned chuck, round or rump)
- 1 teaspoon paprika
- ¼ teaspoon pepper
- 3 tablespoons flour
- 3 tablespoons salad oil or unsalted butter
- 3 cups water
- 1 bay leaf
- ⅛ teaspoon Tabasco
- 4 cloves
- 12 small white onions, peeled
- 6 medium carrots, scraped
- 3 medium potatoes, peeled and halved

Procedure. Have beef cut in 1½-inch pieces. Blend together paprika, pepper and flour Roll pieces of meat in flour mixture. Melt fat in heavy kettle. Add meat and brown on all sides Add water, bay leaf, Tabasco and cloves Cover and simmer 2 to 2½ hours until meat is almost tender Add onions, carrots and potatoes. Cover and cook until vegetables are tender. Yield: 6 to 8 servings

Veal Stew (Uns.)

Ingredients:
- 1½ lbs shoulder of veal
- ¼ cup salad oil or unsalted butter
- 1 clove garlic, minced
- ⅛ teaspoon pepper
- ¼ teaspoon powdered thyme
- ½ bay leaf
- ⅛ teaspoon Tabasco
- 4 fresh tomatoes, peeled and diced
- ½ cup water

Procedure. Have veal cut into 2-inch pieces Heat oil or butter in heavy skillet. Add garlic and meat and brown meat well. Add remaining ingredients Cover and cook over low heat 1½ hours, or until meat is tender. Yield: 6 servings.

Meat Loaf (Uns.)

Ingredients:
- ½ cup ground beef
- ⅓ cup soft, unsalted bread crumbs
- 1 tablespoon minced onion
- 4 tablespoons unsalted tomato juice
- ⅛ teaspoon dry mustard
- Pepper
- Chopped parsley
- Bay leaf

Procedure: Combine all ingredients, except bay leaf, and mix thoroughly with wet hands Shape into a loaf and place in a baking pan Cover with bay leaf and bake in moderate oven (375° F.) 1 hour. Yield: 2 servings

Creamed Tuna Fish (Uns.)

Ingredients:
- 3 tablespoons unsalted butter or other shortening
- 3 tablespoons flour
- 2 cups milk
- 1 tablespoon lemon juice
- Paprika
- 1 can low sodium "dietetic" tuna

Procedure: Melt butter or other shortening in double boiler or over low direct heat. Stir in flour Stir in milk and continue stirring until sauce thickens. Add lemon juice and paprika Add tuna, flaked but not drained, and reheat. Serve over rice or macaroni cooked without salt. Yield: 4-5 servings.

Vegetables

Fortunately, a number of vegetables are low in sodium, and their use adds variety to restricted meals. As no salt can be used in cooking, every care must be taken to preserve the natural fresh flavor. They should be of the best quality when purchased and should be cooked in as small an amount of water as possible The use of certain spices (*see* p 565) with unsalted butter, cream or salad oil may be desirable. The combination of lemon juice with sweet butter also makes a good dressing for certain

canned without salt, according to the following list, are generally allowed:

Asparagus	Corn
Beans (green)	Endive
Broccoli	Lettuce
Brussels sprouts	Mushrooms
Cabbage	Onions
Carrot	

Peppers
Potatoes (sweet or white)
Radishes
Rutabagas
Soybeans
Squash
Tomatoes
Turnip greens

(Use also fresh or specially canned peas and Lima beans, dried beans, dried peas, lentils)

Scalloped Potatoes (Uns.)

Ingredients:
- 4 medium potatoes
- 2 tablespoons unsalted butter
- 2 tablespoons flour
- 1 to 2 tablespoons minced onion
- Pepper
- 2 cups milk (about)

Procedure. Pare potatoes and cut in thin, crosswise slices Reserve enough potatoes for a top layer Place half the potatoes in a buttered baking dish (use unsalted butter) Cover with half the fat cut into tiny bits or melted Sprinkle with half the flour, onion and pepper Repeat Top casserole with remaining potatoes Pour in milk until it can be seen between pieces of potatoes. Cover and bake in moderate oven (350° F) for [illegible] hour Uncover and bake for 1 hour longer or until tender and brown on top Yield. 4 servings.

NOTE: If it is desired to lower the sodium content still more, use Lonalac instead of milk

Sweet Potato and Apple Casserole

Ingredients:
- 1 large sweet potato, boiled, unsalted
- [illegible] cup applesauce
- Sugar
- Cinnamon

Procedure: Place in buttered casserole alternate layers of sliced sweet potato and applesauce. Top with sugar and cinnamon and heat in oven until hot. Serve immediately.

Breads

Bread (Uns.)

Ingredients:
- [illegible] cup liquefied low sodium milk
- 1[illegible] teaspoons sugar
- 2 tablespoons unsalted shortening
- [illegible] package or cake yeast, active dry or compressed
- [illegible] cup water (warm for dry, lukewarm for compressed)
- 3 cups sifted all-purpose flour

Procedure: Scald milk Stir in sugar and [illegible]

[illegible] turn over once to grease all sides Cover [illegible]

and let rise again in warm place until double in bulk Bake in moderate oven (350° F) about 1 hour, or until done Yield About 20 slices

Cinnamon Toast (Uns.)

Procedure. Mix cinnamon with granulated sugar, using 1 part cinnamon to 3 parts sugar Sprinkle this mixture generously over hot unsalted buttered toast made from unsalted bread, and serve hot

Popovers (Uns.)

Ingredients.
- 1 egg
- [illegible] cup low sodium milk or water
- [illegible] cup sifted flour

Procedure: Break egg into bowl, add milk or water, and beat with rotary beater until well blended. Add sifted flour all at one time and continue beating until mixture is smooth and as thick as heavy cream Bake in hot, greased iron muffin pans or glass or earthenware custard cups in hot oven (450° [illegible]

Desserts

Peppermint Tapioca (Uns.)

Ingredients:
- 1 egg yolk
- 1[illegible] cups liquefied low sodium milk
- 3 tablespoons quick-cooking tapioca
- [illegible] cup sugar
- 2 drops peppermint oil
- 1 egg white

Procedure: Mix egg yolk with a little low sodium milk in top of double boiler. Add remaining milk, tapioca and sugar. Cook 5 to 8 minutes, stirring occasionally, until mixture thickens slightly and tapioca is clear Add flavoring. Beat egg white until stiff Pour hot tapioca mixture over it, stirring in gently The mixture will be thin, but it will thicken as it cools Serve with cold chocolate sauce Yield 4 servings

NOTE Vanilla extract may replace the peppermint oil.

Chocolate Sauce (Uns.)

Ingredients:
- 1 cup liquefied low sodium milk
- 1 square chocolate or ¼ cup cocoa (not Dutch process cocoa)
- ¼ cup sugar
- 1 tablespoon flour
- ½ teaspoon vanilla

Procedure: Scald milk and chocolate in top of double boiler until chocolate is melted. Mix dry ingredients (If cocoa is used instead of chocolate, mix with the flour and the sugar Pour scalded milk on dry ingredients and return to double boiler. Stir until thick Add vanilla Serve hot or cold as desired Yield. 1¼ cups

Fruit Sherbet (Uns.)

Ingredients.
- ½ cup lemon, orange or lime juice
- 2 teaspoons grated lemon, orange or lime rind
- 1 cup sugar
- 1½ teaspoons unflavored gelatin
- 2 tablespoons cold water
- ¼ cup hot liquefied low sodium milk
- 1 cup cold liquefied low sodium milk
- 1 egg white, stiffly beaten
- 1 drop food coloring (optional)

Procedure: Turn cold control of automatic refrigerator to coldest setting Combine juice, rind and sugar and let stand until sugar is dissolved Soften gelatin in cold water Dissolve in hot low sodium milk and add to sugar mixture Slowly stir in

creamy. Return to freezing tray. Refreeze until just firm enough to serve. Yield 6 servings

Apple Cobbler (Uns.)

Ingredients:
- ¼ cup softened unsalted butter
- 1 cup sugar
- ⅔ cup sifted all-purpose flour
- 4 cups sliced apples
- ¼ cup water
- 1 teaspoon cinnamon

Procedure Heat oven to 350° F. Grease 10 x 6 x 1½-inch baking dish. Cream butter and sugar together. Blend in flour, mixing well. Place apples in baking dish. Sprinkle with water and cinnamon. Spread flour mixture on top of apples Bake in moderate oven (350° F.) 40 to 45 minutes Serve warm with or without vanilla sauce Yield: 6 servings

Chocolate Pudding (Uns.)

Ingredients:
- 1 square unsweetened chocolate
- 1¾ cups scalded liquid Lonalac
- 2½ tablespoons cornstarch
- ¼ cup sugar
- ¼ cup cold liquid Lonalac
- ½ teaspoon vanilla

Procedure: Put chocolate and scalded Lonalac in top of double boiler and heat over boiling water until chocolate has melted Beat with rotary beater until well blended Mix cornstarch and sugar and stir into cold Lonalac Stir into scalded Lonalac mixture in top of double boiler. Continue stirring over boiling water until mixture has thickened Cover and cook for 10 to 15 minutes Remove from heat and add vanilla. Pour into molds or sherbet glasses and chill until firm Yield 4 to 6 servings

The following recipes are extremely low in sodium and may be included in the Kempner Rice Diet.

Apricot Rice (Uns.)

Ingredients:
- ⅔ cup packaged precooked rice
- 1¼ cups apricot nectar
- 3 tablespoons sugar

Procedure. Combine rice and apricot nectar in saucepan Mix just until all rice is moistened Bring quickly to a boil over high heat, uncovered, fluffing rice gently once or twice with a fork. (Do *not* stir.) Cover and

simmer 5 minutes. Remove from heat and let stand 10 minutes. Add sugar, mixing lightly. Cool to room temperature. Yield: 4 servings.

Pineapple Rice (Uns.)

Ingredients

⅔ cup packaged precooked rice
Pineapple juice plus water to make 1⅓ cups
¼ cup drained canned crushed pineapple
⅓ cup sugar

Procedure: Combine rice and pineapple juice and water in saucepan. Mix just until all rice is moistened. Bring quickly to a boil over high heat, uncovered, fluffing rice gently once or twice with a fork. (Do not stir.) Cover and simmer 5 minutes. Remove from heat. Let stand 10 minutes. Add pineapple and sugar, mixing lightly. Cool to room temperature. Then chill about 1 hour. Yield: 4-5 servings.

Baked Rice with Fruit (Uns.)

Ingredients:

¼ cup rice, steamed in unsalted water
½ cup canned apricots, peaches, blue plums, stewed apples or rhubarb

Procedure: Combine the drained rice and fruit (including some juice) in a casserole. Sprinkle with brown sugar and place under a broiler until sugar has melted and top of the mixture is browned. Yield: 2 servings.

Puffed Rice Balls (Uns.)

Ingredients:

1 cup sugar
⅓ cup water
2 teaspoons lemon juice
3 cups puffed rice

Procedure: Boil the sugar, water and lemon juice to the hard-ball stage (265° F.). Pour the syrup very quickly over the puffed rice in a bowl. Make into small balls, allowing to cool on waxed paper.

See Bibliography in Part Four for books on Cookery.

PART FOUR

Tabular Material and Special Tests

Tables

Special Tests

TABLE 1

Composition of Foods
Edible Portion in Common Measures

EXPLANATION OF TABLE

This table of food values gives proximate composition and mineral and vitamin content of most foods in common use in the United States. It includes processed and prepared foods where such foods would not be consumed in the natural state. The foods have been arranged alphabetically for convenience. The values for 100-Gm. portions are

the common measures of Table 6. For the sources of data compiled in this publication and other pertinent information it is recommended that the student read the preamble to Handbook No 8, by B. K Watt and A. L Merrill, Composition of Foods—Raw, Processed, Prepared, published by the Department of Agriculture in 1950.

Reliability of Data

Research in food values has demonstrated repeatedly that the composition of foods is variable, due to differences in variety, soil and climate in which grown, the method of handling, and the sampling and the analyzing. The values given are usually averages of several determinations on a variety of samples and frequently include a wide range of values; therefore, it seems unnecessary to retain decimals where they are of questionable significance Thus the values for calories and for grams of protein, fat, carbohydrate and water are given in whole numbers, and fiber is carried to one decimal place only.

Minerals and vitamins listed on the right hand pages are all measured in milligrams (mg.), except for vitamin A, which is still usually given in International Units (I.U.). In order to be consistent in the use of mg., it is necessary to use decimals for measuring the B complex vitamins because they are present in such small amounts.

The common measures for 100-Gm. or other quantities commonly used are only approximate. For instance, 100 Gm. of most liquids would measure about ⅖ of a cup. Since this is not a convenient fraction for measuring, the designation *½ cup scant* has been used This would mean about 1½ tbsp. less than ½ cup

The individual nutrients in foods have been determined by many different laboratories and the data assembled by the Department of Agriculture or other agencies. The frozen-food samples were taken from the 1953 and the 1954 production seasons, and values were determined by Burger *et al.* in 1956.

Food Energy

The major difference in this table from previous editions is in the calculation of calories, the units used for expressing food energy. In this edition, as in Handbook No 8, calories have not been calculated by applying the general calorie factors 4, 9 and 4 to the percentage composition of protein, fat and carbohydrate, respectively, as usually has been done before. Instead, more specific factors have been developed for individual foods, the digestibility and the physiologic value of each being taken into consideration It will be found, therefore, that this modification of earlier practices may give slightly different energy values for certain foods from those to which we have become accustomed.

Signs and Symbols Used

An asterisk in the table indicates an item for which the composition has been calculated from a recipe

Parentheses denote imputed values for which little or no experimental evidence was available, for which there was relatively little basis for imputing a value from another form of the food, or for which reported data were not considered to be suitable.

Dashes show that no basis could be found for imputing a value, although there was some reason to believe that a measurable amount of the constituent might be present.

The designation Tr. (trace) is used to indicate values that would round to zero with the number of decimal places carried in these tables. Thus Tr. means 0 4 Gm or less of protein, fat, carbohydrate or water, or 0.04 mg or less of iron.

References Used in Compiling Food Tables

Bowes, A. deP., and Church, C E Food Values of Portions Commonly Used Available from A. deP. Bowes, 7th and Delancey Streets, Philadelphia, 1956

[illegible]

Kellogg's Ready-to-Eat Cereals Nutritive Values, 1956

National Canners Association Canned Food Tables, 1957.

Watt, B K., and Merrill, A L.: Composition of Foods—Raw, Processed, Prepared, U.S D.A Agriculture Handbook No. 8, 1950

TABLE 1
COMPOSITION OF FOODS EDIBLE PORTION

Food and Description	Wt. Gm.	Approximate Measure	Food Energy Cal.	Protein Gm.	Fat Gm.	Carbohydrate Total Gm.	Carbohydrate Fiber Gm.	Water Gm.
Almonds, unblanched	100	¾ c.	597	19	54	20	2.7	5
	15	12–15 nuts	90	3	8	3	.4	1
Apple:								
Raw	100	1 small 2 in. diam.	58	Tr.	Tr.	15	1.0	84
Frozen, sliced	100	½ c. sliced	92	Tr.	Tr.	24	.7	75
Apple Betty*	100	½ c.	150	2	3	31	.8	64
Apple juice, fresh or canned	100	½ c. scant	50	Tr.	0	14		86
	249	1 c.	124	Tr.	0	34		215
Apple sauce, canned								
Unsweetened	100	½ c. scant	42	Tr.	Tr.	11	1 6	88
Sweetened	100	½ c. scant	72	Tr.	Tr.	20	.6	80
Strained (infant food)	30	1 oz	17	Tr.	Tr.	5	Tr.	25
Apricots:								
Raw	100	3 medium	51	1	Tr.	13	.6	85
Canned.								
Solids and liquid water pack	100	½ c. scant	32	1	Tr.	18	.3	91
Syrup pack (or frozen)	100	½ c. scant	80	1	Tr.	21	.4	77
Strained (infant food)	30	1 oz.	17	Tr.	Tr.	5	Tr.	25
Dried, sulfured	100	20 large or 30 small halves	262	5	Tr.	67	3.2	24
Cooked, sweetened fruit and liquid*	100	½ c.	123	2	Tr.	32	.9	66
Frozen	100	½ c.	98	1	Tr.	25	.6	73
Asparagus:								
Cooked, fresh or frozen	100	½ c. cut or 6–7 spears	20	2	Tr.	4	.8	93
Canned.								
Green, drained, solids	100	½ c. cut or 6–7 spears	17	2	Tr.	3	.8	93
Frozen, spears	100	½ c cut or 6–7 spears	24	3	Tr.	4	.8	92
Avocados, raw	100	½ peeled	245	2	26	5	1 8	65

Tr (trace) is used to indicate values that would round to zero with the number of decimal places carried in this table Thus Tr means 0 4 Gm or less of protein, fat, carbohydrate or water.

* Values are calculated from a recipe.

TABLE 1 (*Continued*)
MINERALS AND VITAMINS IN FOODS

List	Wt	Minerals			Vitamins				
		Ca Mg.	P Mg	Fe Mg	Vitamin A IU	Thiamine Mg	Riboflavin Mg.	Niacin Mg	Ascorbic Acid Mg.
Almonds	100	254	475	4 4	0	.25	67	4 6	Tr.
	15	38	71	.7	0	.04	1	.7	Tr.
Apples:									
Raw	100	6	10	.3	90	04	.02	.2	5
Frozen, sliced	100	5	6	.5	17	.01	03	.2	7
Apple Betty	100	15	25	1	160	06	.04	.5	1
Apple juice	100	6	10	.5	40	.02	03	Tr.	1
	249	15	25	1.2	90	.05	07	Tr.	2
Apple sauce:									
Unsweetened or sweetened	100	4	8	.4	30	.02	.01	Tr.	1
Strained	30	1	2	.1	20	Tr.	Tr	Tr.	1
Apricots:									
Raw	100	16	23	.5	2,790	03	05	.8	7
Canned, water or syrup pack (or frozen)	100	10	15	.3	1,350	.02	.02	.3	4
Strained	30	6	9	(.3)	(480)	Tr.	Tr	(.1)	(1)
Dried, sulfured	100	86	119	4 9	7,430	.01	.16	3 3	12
Cooked, sweetened	100	24	34	1 4	2,110	Tr.	.04	.9	3
Frozen	100	10	19	.9	1,700	02	04	.8	27a
Asparagus:									
Cooked	100	19	53	1.0	1,040	13	.17	1.2	23
Canned									
Green	100	18	43	1.7	600	.08	.10	.9	15
Frozen spears	100	23	69	1.2	780	.18	.15	1.3	29
Avocados, raw	100	10	38	.6	290	06	.13	1 1	16

Tr. *See* footnote on page 576

Note Parentheses indicate imputed values for which little or no experimental evidence was available, for which there was relatively little basis for imputing a value from another form of the food, or for which reported data were not considered to be suitable

a—ascorbic acid added in processing.

TABLE 1 (*Continued*)
COMPOSITION OF FOODS EDIBLE PORTION

FOOD AND DESCRIPTION	Wt. Gm.	Approximate Measure	Food Energy Cal.	Protein Gm.	Fat Gm.	CARBOHYDRATE Total Gm.	CARBOHYDRATE Fiber Gm.	Water Gm.
Bacon, broiled or fried	100	12 strips	607	25	55	1	0	13
	16	2 strips	97	4	9	Tr.	0	3
Bacon, Canadian, raw	100	3½ ozs.	231	22	15	Tr.	0	56
Bananas, raw	100	1 medium	88	1	0	23	.6	75
Barley, pearled, light dry	100	½ c.	349	8	1	79	.5	11
Beans, common or kidney.								
Red kidney, canned or cooked, solids and liquids	100	½ c scant	90	6	Tr.	16	.9	76
Canned, baked								
Pork and molasses	100	½ c. scant	125	6	3	19	.9	70
Pork and tomato sauce	100	½ c. scant	113	6	2	18	1 0	72
Beans, Lima:								
Cooked, fresh or frozen	100	⅝ c.	95	5	Tr.	18	2.0	75
Canned, drained solids	100	½ c. scant	95	5	Tr.	18	2 0	75
Beans:								
Snap green·								
Cooked, fresh or frozen (small amount water, short time)	100	¾ c.	22	1	Tr	5	.5	93
Canned, drained solids	100	¾ c.	22	1	Tr.	5	.5	93
Strained (infant food)	30	1 oz.	6	1	Tr.	1	.3	27
Wax or yellow·								
Canned, drained solids	100	½ c. scant	22	1	Tr.	5	.5	93
Beef cuts, medium fat:								
Chuck, cooked	100	3½ ozs. without bone	309	26	22	0	0	51
Flank, cooked	100	3½ ozs. without bone	314	25	23	0	0	51

Tr *See* footnote on page 576

TABLE 1 (*Continued*)

MINERALS AND VITAMINS IN FOODS

List	Wt.	Minerals			Vitamins				
		Ca Mg	P Mg	Fe Mg	Vitamin A I U.	Thiamine Mg	Riboflavin Mg	Niacin Mg.	Ascorbic Acid Mg.
Bacon, broiled or fried	100 16	25 4	255 41	3.3 .5	0 0	.48 .08	.31 .05	4.8 .8	0 0
Bacon, Canadian	100	13	210	3.3	0	.91	.25	5.2	0
Bananas, raw	100	8	28	.6	430	.04	.05	.7	10
Barley, pearled	100	16	189	(2.0)	0	.12	.08	3.1	0
Beans:									
Red kidney, canned solids and liquids	100	40	124	1.9	0	.05	.05	.8	0
Canned, baked									
Pork and molasses	100	56	113	2.1	30	.05	.04	.5	2
Pork and tomato sauce	100	41	113	1.8	80	.05	.04	.5	2
Beans, Lima:									
Cooked	100	29	77	1.7	290	.14	.09	1.1	15
Canned	100	29	77	1.7	180	.03	.05	.5	6
Beans:									
Snap green									
Cooked, fresh or frozen	100	36	23	.7	660	.07	.10	.5	14
Canned	100	36	23	1.7	500	.04	.05	.4	5
Strained	30	9	7	.2	140	.01	.02	.1	1
Wax or yellow, canned	100	36	23	1.7	120	.04	.05	.4	5
Beef cuts, cooked									
Chuck	100	11	117	3.1	0	.05†	.20†	4.1†	0
Flank	100	11	117	3.0	0	.05†	.20†	4.1†	0

Note Parentheses indicate imputed value.

† Prepared by braising or pot roasting Use of drippings would add approximately 10 per cent more thiamine and niacin and 25 per cent more riboflavin.

TABLE 1 (*Continued*)
COMPOSITION OF FOODS EDIBLE PORTION

Food and Description	Wt. Gm.	Approximate Measure	Food Energy Cal.	Protein Gm	Fat Gm.	Carbohydrate Total Gm.	Carbohydrate Fiber Gm	Water Gm
Beef cuts (*Continued*)								
Hamburger, cooked	100	3½ ozs.	364	22	30	0	0	47
	50	1 patty	182	11	15	0	0	24
Porterhouse, cooked	100	3½ ozs. without bone	342	23	27	0	0	49
Rib roast, cooked	100	3½ ozs. without bone	319	24	24	0	0	51
Round, cooked	100	3½ ozs. without bone	233	27	13	0	0	59
Rump, cooked	100	3½ ozs. without bone	378	21	32	0	0	46
Sirloin, cooked	100	3½ ozs. without bone	297	23	22	0	0	54
Beef, canned.								
Corned beef hash	100	3½ ozs.	141	14	6	7	.2	70
Roast beef	100	3½ ozs.	224	25	13	0	0	60
Strained (infant food)	30	1 oz.	30	5	1	0	0	23
Beef, corned, boneless, medium fat	100	3½ ozs.	216	25	12	0	0	59
Beef, dried or chipped	100	3½ ozs.	203	34	6	0	0	48
	60	2 ozs —average serving	115	19	4	0	0	29
Beef and vegetable stew*	100	½ c scant	107	6	8	7	.4	79
Beer (average, 4 per cent alcohol)	100	⅜ c scant	48	1	0	4		90
Beets, cooked or canned, drained solids	100	½ c.	41	1	Tr.	10	.8	88
Beet greens, cooked	100	⅝ c.	27	2	Tr.	6	1 4	90
Beverages, carbonated:								
Ginger ale	100	3½ ozs.	35			9		91
Other, including cola type	100	3½ ozs.	46			12		88
Biscuits, baking powder, made with enriched flour*	100	3 biscuits 2-in diam.	342	8	10	52	.2	27

Tr See footnote on page 576
* Values are calculated from a recipe

TABLE 1 (*Continued*)

MINERALS AND VITAMINS IN FOODS

List	Wt	Minerals			Vitamins				
		Ca Mg	P Mg	Fe Mg	Vitamin A I U	Thiamine Mg	Riboflavin Mg.	Niacin Mg	Ascorbic Acid Mg.
Beef cuts (*Continued*)									
Hamburger	100	9	158	2 8	0	08	19	4 8	0
Patty	50	5	79	1 4	0	04	10	2 4	0
Porterhouse	100	11	170	3 0	0	06	18	4 7	0
Rib roast	100	10	185	3 0	0	.06	.18	4 3	0
Round	100	11	224	3 4	0	.08	.22	5 5	0
Rump, cooked	100	8	85	2 5	0	04†	.15†	3 1†	0
Sirloin, cooked	100	10	175	2 9	0	06	.19	4 8	0
Beef, canned									
Corned beef hash	100	26	146	1 3	Tr	03	.14	2 9	0
Roast beef	100	16	118	2 4	0	02	.23	4.2	0
Strained	30	3	43	1.2	0	Tr.	06	9	0
Beef, corned, medium fat	100	20	106	4 3	0	02	.24	3 4	0
Beef, dried, chipped	100	20	404	5 1	0	(07)	(32)	(3 8)	0
	60	11	229	2 9	0	(04)	(18)	(2.2)	0
Beef stew	100	13	75	1 1	1,070	.05	06	1 5	6
Beer (4 per cent alcohol)	100	4	26	0	0	Tr	03	.2	0
Beets, cooked or canned	100	21	31	.7	20	02	04	.3	7
Beet greens, cooked	100	118‡	45	3.2	7,440	05	.16	.4	15
Beverages									
Ginger ale	100								
Cola type	100								
Biscuits, baking powder with enriched flour	100	218	193	1.8	0	.23	.22	2.0	0

Tr See footnote on page 576

Note Parentheses indicate imputed value.

† Prepared by braising or pot roasting Use of drippings would add approximately 50 per cent more thiamine and niacin and 25 per cent more riboflavin.

‡ Calcium may not be available because of the presence of oxalic acid.

TABLE 1 (*Continued*)
COMPOSITION OF FOODS EDIBLE PORTION

FOOD AND DESCRIPTION	Wt. Gm	Approximate Measure	Food Energy Cal.	Protein Gm.	Fat Gm	Carbohydrate Total Gm	Carbohydrate Fiber Gm.	Water Gm.
Blackberries.								
Raw	100	⅔ c.	57	1	1	13	4.2	85
Canned, solids and liquids.								
Water pack	100	½ c. scant	43	1	1	9	2.0	89
Syrup pack	100	½ c. scant	86	1	Tr	23	2 9	76
Blueberries·								
Raw	100	⅔ c.	61	1	1	15	1.2	83
Frozen without sugar	100	⅔ c.	56	1	Tr.	14	1.5	85
Canned, solids and liquid.								
Water pack	100	½ c. scant	37	Tr.	Tr.	9	1.0	90
Syrup pack	100	½ c. scant	98	Tr.	Tr.	26	1 0	73
Bouillon cubes	100	25 cubes	48	(1)	3	0	0	5
	4	1 cube	2	Tr.	Tr.	0	0	Tr.
Brains, all kinds, raw	100	3½ ozs.	125	10	9	1	0	79
Bran (breakfast cereal, almost wholly bran)	28	1 oz	95	3	1	21	2 0	1
Bran flakes (40 per cent bran)	100	2⅘ c.	359	10	2	80	3 5	4
	28	¾ c.	101	3	1	22	1 0	2
Bran, raisin	100	2 c	350	9	2	79	3 0	6
Brazil nuts, shelled	100	¾ c.	646	14	66	11	2.1	5
Breads·*								
Boston brown bread made with degermed corn meal, enriched	100	2 sl 3x¾ in.	219	5	2	46	3	45
Cracked wheat bread made with enriched flour	100	4 sl	259	9	2	51	.5	36
	23	1 sl	60	2	1	12	.1	9
French or Vienna breads, enriched or unenriched	100	3½ ozs.	270	8	3	52	.2	36

Tr *See* footnote on page 576
Note· Parentheses indicate imputed value.
* Values are calculated from a recipe

TABLE 1 (*Continued*)
MINERALS AND VITAMINS IN FOODS

List	Wt.	Minerals			Vitamins				
		Ca Mg	P Mg	Fe Mg.	Vitamin A I U	Thiamine Mg	Riboflavin Mg.	Niacin Mg	Ascorbic Acid Mg.
Blackberries;									
Raw	100	32	32	.9	200	.04	.04	.4	21
Canned, water or syrup pack	100	18	19	(.7)	180	.01	.02	.2	6
Blueberries:									
Raw	100	16	13	.8	280	(.02)	(.02)	(.3)	16
Frozen without sugar	100	10	13	.8	67	.03	.06	.5	7
Canned, water or syrup pack	100	11	6	(.5)	40	.01	.01	.2	13
Bouillon cubes	100						1.80	25.6	0
	4						.07	1.0	0
Brains	100	16	330	3.6	0	.23	.26	4.4	18
Bran cereal	28	24	350	2.9	0	.11	.09	5.0	0
Bran flakes	100	57	602	4.6	0	.35	.18	8.5	0
	28	16	170	1.3	0	.10	.05	2.4	0
Bran, raisin	100	60	500	4.5	0	.30	.16	7.0	0
Brazil nuts	100	186	693	3.4	Tr	.86			.
Breads:									
Boston brown bread, enriched	100	185	158	2.9	140	.13	.17	1.9	0
Cracked wheat bread, enriched	100	83	128	2.0	0	.25	.19	2.5	0
	23	19	29	.5	0	.06	.04	.6	0
French or Vienna									
Unenriched	100	24	71	.7	0	.05	.06	.9	0
Enriched	100	24	71	1.8†	0	.24†	.15†	2.2†	0

Tr See footnote on page 575.
Note Parentheses indicate imputed value.
† Iron, thiamine, riboflavin and niacin are based on the minimum level of enrichment specified by the Federal Security Agency.

Table 1 (*Continued*)
Composition of Foods Edible Portion

Food and Description	Wt. Gm.	Approximate Measure	Food Energy Cal.	Protein Gm.	Fat Gm.	Carbohydrate Total Gm	Carbohydrate Fiber Gm.	Water Gm
Breads (*Continued*)								
Italian bread, enriched or unenriched	100	3½ ozs.	263	9	1	54	.2	35
Raisin bread, enriched	100	4 sl.	284	7	3	58	.2	30
	23	1 sl.	65	2	1	13	Tr	7
Rye bread, American (⅓ rye, ⅔ clear flour)	100	4 sl	244	9	1	52	.4	35
	23	1 sl.	57	2	Tr.	12	.1	9
White bread, unenriched, 4 per cent nonfat milk solids†	100	4 sl	275	9	3	52	.2	35
	23	1 sl.	63	2	1	12	Tr.	9
White bread, enriched								
2 per cent nonfat milk solids	100	4 sl.	276	8	3	52	.2	35
	23	1 sl	64	2	1	12	.	..
4 per cent nonfat milk solids†	100	4 sl	275	9	3	52	.2	35
	23	1 sl.	63	2	1	12		.
6 per cent nonfat milk solids	100	4 sl	276	9	3	52	.2	34
	23	1 sl	63	2	1	12		
Whole wheat bread	100	4 sl.	240	9	3	49	1 5	37
	23	1 sl.	55	2	1	11	.4	9
Bread crumbs, dry	100	1 c	385	12	5	72	.2	9
Breakfast foods See individual grain, as corn, oatmeal, etc.								
Broccoli, flower stalks, fresh or frozen	100	⅔ c	28	3	Tr.	5	1.1	90
Brussel sprouts, fresh or frozen	100	¾ c.	36	3	Tr	7	1 2	88
Buckwheat flour, light	100	1 c. sifted	347	6	1	80	.5	12
Bun, hamburger. *See* Rolls.								

Tr *See* footnote on page 576

† When the amount of nonfat milk solids in commercial bread is unknown, use bread with 4 per cent nonfat milk solids

TABLE 1 (*Continued*)
MINERALS AND VITAMINS IN FOODS

List	Wt	Minerals			Vitamins				
		Ca Mg	P Mg	Fe Mg	Vitamin A I U.	Thiamine Mg.	Riboflavin Mg	Niacin Mg.	Ascorbic Acid Mg.
Breads (*Continued*)									
Italian bread									
Unenriched	100	13	77	7†	0	.05†	.07†	1 0†	0
Enriched	100	13	77	1 8	0	.24	15	2.2	0
Raisin bread, enriched	100	80	104	1 8†	10	.24†	.15†	2 2†	0
	23	18	24	4	Tr	.06	.04	.5	0
Rye bread, American	100	72	147	1 6	0	18	08	1 5	0
	23	17	34	4	0	.04	.02	4	0
White bread, unenriched, 4% nonfat milk solids	100	79	92	.6	0	.05	.11	.9	0
	23	18	21	.1	0	01	02	.2	0
White bread, enriched, 2 per cent nonfat milk solids	100	65	81	1 8†	0	24†	15†	2.2†	0
	23	15	19	.4	0	06	04	.5	0
4 per cent nonfat milk solids	100	79	92	1 8†	0	.24†	.15†	2.2†	0
	23	18	21	.4	0	06	04	.5	0
6 per cent nonfat milk solids	100	92	101	1 8†	0	.24†	15†	2.2†	0
	23	21	23	4	0	06	04	.5	0
Whole wheat bread	100	96	263	2 2	0	30	13	3 0	0
	23	22	60	.5	0	07	.03	.7	0
Bread crumbs	100	111	129	2 6	0	.27	.22	3 1	0
Breakfast foods. *See* individual grain.									
Broccoli	100	43	60	.7	1,880	07	.13	.6	78
Brussels sprouts, cooked	100	22	62	.9	560	.1	.11	.6	87
Buckwheat flour, light	100	11	88	1.0	0	.08	(04)	(4)	0

Tr *See footnote on page 578*
Note Parentheses indicate imputed value
† Iron, thiamine riboflavin and niacin are based on the minimum level of enrichment specified by the Federal Security Agency.

TABLE 1 (*Continued*)

COMPOSITION OF FOODS EDIBLE PORTION

FOOD AND DESCRIPTION	Wt. Gm.	Approximate Measure	Food Energy Cal.	Protein Gm.	Fat Gm.	CARBOHYDRATE Total Gm.	CARBOHYDRATE Fiber Gm	Water Gm.
Butter	100	½ c scant	716	1	81	Tr.	0	16
	14	1 tbsp.	100	Tr.	11	Tr.	0	2
Buttermilk, cultured (made from skim milk)	100	½ c. scant	36	4	Tr.	5	0	91
Cabbage								
Raw	100	wedge 3½x4½ in.	24	1	Tr.	5	1	92
Cooked (small amount of water short time)	100	1⅓ c.	24	1	Tr.	5	1	92
Cabbage, celery or Chinese, raw	100	1 c., 1-in. pieces	14	1	Tr.	2	.5	95
Cakes:								
Angel food	100	2 pieces	270	8	Tr.	59	0	32
	40	2-in. section	108	3	Tr	24	0	12
Foundation, plain icing	100	3-in section, layer cake	342	5	9	60	.1	24
Foundation, fudge icing	100	3-in section, layer cake	349	4	12	59	.2	24
Fruit, dark	100	3 pieces 2x2x½ in	354	5	14	56	1.2	23
Plain cake and cup cakes	100	2 cup cakes	327	6	8	57	.1	27
Plain cake and cup cakes, iced	100	2 cup cakes	322	5	6	62	.1	25
Sponge	100	2 large pieces	291	8	5	54	.2	32
	40	2-in section of 8-in cake	117	3	2	22	1	12
Candy:								
Candied or glacé peel —lemon, orange or grapefruit peel	100	3½ ozs.	316	Tr	Tr	81	2 3	17
Butterscotch*	100	3½ ozs.	410	0	9	86	0	5
Caramels*	100	3½ ozs.	415	3	12	78	0	7
Chocolate, sweetened, milk	100	3½ ozs.	503	(6)	34	56	5	1
	30	1 oz	143	(2)	10	16	2	Tr.

Tr *See* footnote on page 576

Note Parentheses indicate imputed value

* Values are calculated from a recipe

TABLE 1 (*Continued*)
MINERALS AND VITAMINS IN FOODS

List	Wt.	Minerals Ca Mg.	P Mg	Fe Mg	Vitamins Vitamin A I.U.	Thiamine Mg	Riboflavin Mg.	Niacin Mg.	Ascorbic Acid Mg.
Butter	100	20	16	0	3,300†				0
	14	3	2	0	460†				0
Buttermilk, cultured	100	(118)	93	.1	Tr.	04	.18	.1	1
Cabbage:									
Raw	100	46	31	.5	80	06	05	.3	50
Cooked	100	46	31	5	90	05	05	.3	31
Cabbage, celery, Chinese, raw	100	43	41	9	260	03	04	4	31
Cakes									
Angel food	100	6	24	3	0	01	14	.2	0
	40	2	10	1	0	Tr.	05	1	0
Foundation, plain icing	100	101	96	.4	120	02	.07	.2	0
Foundation, fudge icing	100	98	101	4	120	02	08	.2	0
Fruit, dark	100	97	126	2 8	160	14	14	1.1	0
Plain cake	100	155	137	.4	120	03	08	.3	0
Plain cake, iced	100	117	104	4	90	02	.07	.2	0
Sponge	100	28	110	1 4	520	.05	.15	.2	0
	40	11	44	6	210	02	06	.1	0
Candy:									
Candied or glacé peel—lemon, orange or grapefruit	100								
Butterscotch	100	20	7	1 8	0	0	Tr.	Tr.	0
Caramels	100	126	90	2.3	170	.02	.14	.1	Tr.
Chocolate, sweetened milk	100	216	233	9	150	10	.38	.8	0
	30	61	80	6	40	.03	.11	.2	0

Tr See footnote on page 574
Note. Parentheses indicate imputed value
† Year-round average

TABLE 1 (*Continued*)
COMPOSITION OF FOODS EDIBLE PORTION

FOOD AND DESCRIPTION	Wt. Gm.	Approximate Measure	Food Energy Cal.	Protein Gm	Fat Gm.	CARBOHYDRATE Total Gm.	Fiber Gm	Water Gm.
Candy (*Continued*)								
Chocolate, sweetened, milk, with almonds	100	3½ ozs.	532	(8)	39	50	6	1
	30	1 oz.	151	(2)	11	14	.2	Tr.
Fudge, plain*	100	3½ ozs.	411	2	11	81	.3	5
Hard	100	3½ ozs	383	0	0	99	0	1
Marshmallows	100	3½ ozs.	325	3	0	81	.	15
Peanut brittle*	100	3½ ozs.	441	8	16	73	.8	2
Cantaloupe, raw	100	¼ melon, 5 in. diam.	20	1	Tr.	5	.6	94
Carrots:								
Raw	100	2 carrots, 5½ x 1 in or 1 c. grated	42	1	Tr.	9	1.0	88
Cooked	100	⅔ c.	30	1	1	6	.8	92
Canned.								
Drained solids	100	⅔ c.	30	1	1	6	.8	92
Strained (infant food)	30	1 oz.	7	Tr	0	2	.3	28
Cashew nuts, roasted or cooked	100	3½ ozs.	578	19	48	27	1 3	4
	30	1 oz.	164	5	14	8	.4	1
Cauliflower:								
Raw	100	1 c. flower buds	25	2	Tr.	5	9	92
Cooked, fresh	100	1 c scant	25	2	Tr.	5	.9	92
Frozen, raw	100	1 c. scant	22	2	Tr.	4	.8	93
Celery, bleached								
Raw	100	2 large stalks or 1 c. diced	18	1	Tr.	4	.7	94
Cooked	100	⅘ c. diced	18	1	Tr.	4	.7	94
Cereal foods (infant food), dry, precooked	100	⅔ c. dry	364	14	2	73	1.4	6
	30	1 oz.	103	4	1	21	.4	2
Chard, leaves and stalks, cooked	100	⅔ c.	21	1	Tr	4	.9	92

Tr *See* footnote on page 576
Note Parentheses indicate imputed value
* Values are calculated from a recipe.

TABLE 1 (*Continued*)

MINERALS AND VITAMINS IN FOODS

List	Wt.	Minerals			Vitamins				
		Ca Mg	P Mg.	Fe Mg	Vitamin A I U.	Thiamine Mg	Riboflavin Mg	Niacin Mg.	Ascorbic Acid Mg.
Candy (*Continued*)									
Chocolate, sweetened, milk, with almonds	100	206	249	2 1	140	.13	.51	(1.1)	0
	30	58	71	8	40	.04	.14	(.3)	0
Fudge, plain	100	48	67	.5	220	.01	.07	.1	Tr.
Hard	100	0	0	0	0	0	0	0	0
Marshmallows	100	0	0	0	0	0	0	0	0
Peanut brittle	100	38	124	2 0	30	09	.05	4 9	0
Cantaloupe, raw	100	17	16	.4	3,420	05	.04	.5	33
Carrots:									
Raw	100	39	37	.8	12,000	.06	06	.5	6
Cooked	100	26	26	.6	12,500	.05	05	.4	4
Canned									
Drained solids	100	26	26	.6	17,570	.02	.02	.3	3
Strained	30	7	7	.2	2,530	.01	.01	.1	1
Cashew nuts, roasted or cooked	100	46	428	5 0		63	.19	2.1	.
	30	13	121	1.4		.18	.05	.6	.
Cauliflower:									
Raw	100	22	72	1.1	90	.11	.10	6	69
Cooked	100	22	72	1.1	90	06	08	.5	23
Frozen, raw	100	19	42	.6	30	.06	.06	.5	56
Celery:									
Raw	100	50	40	.5	0	.05	04	4	7
Cooked	100	50	40	.5	0	.04	03	.3	5
Cereal (infants), dry, precooked	100	651	686	33 9	0	1.19	.46	4 9	0
	30	185	194	9 6	0	.34	.13	1.4	0
Chard, cooked	100	105†	36	2 5	3,110	.04	.06	.4	17

Tr See footnote on page 574

Note. Parentheses indicate imputed value.

† Calcium may not be available because of the presence of oxalic acid.

TABLE 1 (*Continued*)

COMPOSITION OF FOODS EDIBLE PORTION

FOOD AND DESCRIPTION	Wt Gm.	Approximate Measure	Food Energy Cal.	Protein Gm	Fat Gm.	CARBOHYDRATE Total Gm.	Fiber Gm.	Water Gm.
Cheese:								
Blue mold, domestic type	100	3½ ozs.	368	22	31	2	0	40
	30	1 oz.	104	6	9	1	0	12
Camembert	100	3½ ozs.	299	18	25	2	0	52
	30	1 oz.	85	5	7	1	0	16
Cheddar	100	3½ ozs	398	25	32	2	0	37
	30	1 oz.	113	7	9	1	0	11
Cheddar, processed	100	3½ ozs.	370	23	30	2	0	40
	30	1 oz.	105	7	9	1	0	12
Cottage, from skim milk	100	½ c.	95	20	1	2	0	77
	30	1 oz.	27	6	Tr	1	0	23
Cream cheese	100	3½ ozs.	371	9	37	2	0	51
	30	1 oz	106	3	11	1	0	15
Limburger	100	3½ ozs.	345	21	28	2	0	45
	30	1 oz.	97	6	8	1	0	14
Parmesan	100	3½ ozs.	393	36	26	3	0	30
	30	1 oz.	112	10	7	1	0	9
Swiss	100	3½ ozs	370	28	28	2	0	39
	30	1 oz.	105	8	8	1	0	12
Swiss, processed	100	3½ ozs.	355	26	27	2	0	40
	30	1 oz	101	8	8	1	0	12
Cherries:								
Sour, sweet and hybrid, raw	100	1 c. whole or ⅔ c. pitted	61	1	1	15	.3	83
Red, sour, pitted, canned	100	½ c scant	48	1	Tr.	12	.1	87
Chicken:								
Raw.								
Broilers, total edible	100	3½ ozs.	151	20	7	0	0	71
Roasters, total edible	100	3½ ozs.	200	20	13	0	0	66
Hens, total edible	100	3½ ozs.	302	18	25	0	0	56
Fryers (cut-up pieces)								
Breast	100	3½ ozs.	104	23	1	0	0	75
Leg	100	3½ ozs.	112	21	3	0	0	75
Canned, boned meat only	100	3½ ozs.	199	30	8	0	0	62

Tr *See* footnote on page 576.

TABLE 1 (*Continued*)
MINERALS AND VITAMINS IN FOODS

List	Wt.	Minerals Ca Mg	P Mg	Fe Mg.	Vitamins Vitamin A I.U.	Thiamine Mg	Riboflavin Mg.	Niacin Mg.	Ascorbic Acid Mg
Cheese:									
Blue mold, domestic	100	315	339	(.5)	(1,240)	03	.61	.4	0
	30	89	96	(.1)	(350)	01	.17	.1	0
Camembert	100	105	184	.5	(1,020)	.04	.75	1.1	0
	30	30	52	.1	(290)	.01	.21	.3	0
Cheddar	100	725	495	1 0	1,400	.02	.42	Tr.	0
	30	206	140	.3	400	.01	.12	Tr.	0
Cheddar, processed	100	673	787	.9	(1,300)	.02	.41	Tr.	0
	30	191	223	.3	(370)	Tr	.12	Tr.	0
Cottage	100	96	189	.3	(20)	.02	.31	(1)	0
	30	27	54	1	(10)	.01	.09	Tr.	0
Cream cheese	100	68	97	.2	(1,450)	(01)	.22	.1	0
	30	19	27	.1	(410)	Tr.	06	Tr.	0
Limburger	100	590	393	.6	1,280	08	.50	.2	0
	30	167	111	.2	360	02	.14	Tr.	0
Parmesan	100	1,160	823	.4	(1,060)	02	73	.2	0
	30	329	233	.1	(300)	01	.21	.1	0
Swiss	100	925	563	.9	1,450	.01	(40)	(.1)	0
	30	262	160	.3	410	Tr	(.11)	Tr.	0
Swiss, processed	100	887	867	9	1,390	01	.40	.1	0
	30	251	246	.3	390	Tr.	.11	Tr.	0
Cherries:									
Raw	100	18	20	.4	620	05	.06	.4	8
Canned	100	11	12	(.3)	720	.03	.02	.2	6
Chicken:									
Raw:									
Broilers	100	14	200	1.5	0	08	.16	10.2	0
Roasters	100	14	200	1.5	0	08	16	8 0	0
Hens	100	14	200	1.5	0	08	.16	8 0	0
Fryers									
Breast	100	14	212	1.1	0	07	09	10.5	0
Leg	100	15	188	1.8	0	.10	.24	5 6	0
Canned	100	14	148	1.6	0	.04	.16	6 4	0

Tr See footnote on page 576

Note. Parentheses indicate imputed value.

TABLE 1 (*Continued*)
COMPOSITION OF FOODS EDIBLE PORTION

FOOD AND DESCRIPTION	Wt. Gm	Approximate Measure	Food Energy Cal.	Protein Gm	Fat Gm.	CARBOHYDRATE Total Gm.	CARBOHYDRATE Fiber Gm.	Water Gm
Chickpeas or garbanzos, dry, whole seed, raw	100	½ c.	359	21	5	61	5.3	11
Chili sauce	100	⅜ c. scant	98	3	Tr.	24	.7	69
	17	1 tbsp.	17	1	Tr.	4	.1	13
Chocolate:								
Bitter or unsweetened	100	3½ ozs.	504	(6)	53	29	2.6	2
	30	1 oz. square	142	(1)	15	8	.8	1
Sweetened, plain	*100*	*3½ ozs.*	*472*	*(2)*	*30*	*63*	*1.4*	*1*
Chocolate beverage, made with milk*	100	⅖ c. scant	96	3	5	11	.1	81
	250	1 c.	239	8	13	26	.3	202
Chocolate syrup	100	⅓ c.	209	(1)	1	57	.6	39
	20	1 tbsp.	42	Tr.	Tr.	11	.1	8
Clams, long and round.								
Raw, meat only	100	3½ ozs.	81	13	1	3	.	80
Canned, solids and liquid	100	3½ ozs.	51	8	1	2		87
Cocoa beverage, made with all milk	100	⅖ c. scant	95	4	5	11	.1	79
	250	1 c.	236	10	12	27	.3	198
Cocoanut:								
Fresh, meat	100	1 c. shredded	359	3	35	14	3.2	47
Dried, shredded (sweetened)	100	3½ ozs.	556	4	39	53	4.1	3
Coleslaw*	100	¾ c.	86	1	6	8	.9	84
Collards:								
Cooked (boiled in small or moderate amount of water)	100	½ c.	40	4	1	7	1.2	87
Frozen, raw	100	½ c	31	3	Tr.	6	1.0	90

Tr *See* footnote on page 576
Note. Parentheses indicate imputed value
* Values are calculated from a recipe

TABLE 1 (*Continued*)
MINERALS AND VITAMINS IN FOODS

List	Wt.	Minerals: Ca Mg	Minerals: P Mg	Minerals: Fe Mg	Vitamins: Vitamin A I U.	Vitamins: Thiamine Mg	Vitamins: Riboflavin Mg	Vitamins: Niacin Mg.	Vitamins: Ascorbic Acid Mg.
Chickpeas, dry	100	92	375	7.1	Tr	.55	17	1.5	(2)
Chili sauce	100	(12)	(18)	(8)	(1,880)	(09)	(07)	(2.2)	(11)
	17	(2)	(3)	(.1)	(320)	(02)	(01)	(4)	(2)
Chocolate:									
Bitter or unsweetened	100	98†	446	(4 4)	60	.05	.24	1.1	0
	30	28†	126	1.2	20	01	.06	.3	0
Sweetened, plain	100	(63)†	(287)	2.8	(30)	(03)	(15)	(6)	0
Chocolate beverage, with milk*	100	104	92	.2	140	03	.16	.1	1
	250	260	230	.5	350	08	40	.3	2
Chocolate syrup	100	(15)†	(86)	(1,4)					.
	20	(3)†	(17)	(3)					.
Clams:									
Raw	100	(96)	(139)	(7 0)	110	.10	.18	(1 6)	
Canned	100	87	125	6 3	(80)	(05)	.10	1 1	
Cocoa beverage, with milk	100	119	114	.4	160	.04	.19	.2	1
	250	298	285	1 0	400	.10	.48	.5	3
Cocoanut:									
Fresh, meat	100	21	98	2.0	0	.10	.01	.2	2
Dried, shredded	100	43	191	3 6	0	Tr	Tr.	Tr.	0
Coleslaw	100	39	27	.4	70	.05	.04	.2	41
Collards:									
Cooked	100	249	58	1 6	7,630	08	.24	(1.7)	44
Frozen, raw	100	191	53	1.1	6,800	.07	.16	.7	63

Tr. *See* footnote on page 576.
Note Parentheses indicate imputed value.
* Values are calculated from a recipe.
† Calcium may not be available because of the presence of oxalic acid.

TABLE 1 (*Continued*)
COMPOSITION OF FOODS EDIBLE PORTION

FOOD AND DESCRIPTION	Wt. Gm	Approximate Measure	Food Energy Cal.	Protein Gm.	Fat Gm.	CARBOHYDRATE Total Gm.	CARBOHYDRATE Fiber Gm	Water Gm.
Cookies:								
Assorted or plain	25	1 cookie, 3 in. diam	109	2	3	19	.	1
Butterscotch, icebox	25	2 small	120	1	6	15	.1	1
Molasses, icebox	25	2 small	120	1	5	17	0	1
Oatmeal	25	1 large, 3½ in. diam.	114	2	4	18	Tr.	1
Sugar	20	1 cookie, 3 in. diam.	64	1	3	9	.	1
Corn, sweet:								
Cooked, fresh or frozen	100	⅔ c. or 1 small ear	85	3	1	20	.8	76
Canned								
Cream style	100	½ c. scant	80	2	1	19	.8	81
Whole kernel	100	½ c. scant	64	2	1	16	.8	81
Corn bread or muffins* made with.								
Whole ground corn meal	100	2 muffins, 2¾ in. diam.	215	7	6	35	.6	49
Enriched, degermed corn meal	100	2 muffins, 2¾ in diam	219	7	5	37	.2	49
Cornflakes (added thiamine, niacin and iron)	100	4 c.	372	8	Tr.	86	.6	4
	28	1 c., 1 oz. pkg.	105	2	Tr.	24	.2	1
Corn and soy shreds (added thiamine and niacin)	100	2⅓ c.	364	18	Tr.	74	1.0	3
	28	⅔ c., 1 oz pkg	103	5	Tr.	21	.3	2
Corn grits, degermed, white.								
Unenriched, cooked*	100	½ c scant	51	1	Tr	11	.1	87
Enriched, cooked*	100	½ c scant	51	1	Tr.	11	.1	87
Corn meal, white or yellow·								
Degermed, unenriched, cooked*	100	½ c. scant	50	1	Tr.	11	.1	88
Degermed, enriched, cooked*	100	½ c scant	50	1	Tr.	11	.1	88
Corn pops, sugared	28	1 c.	107	1	Tr.	26	.1	
Corn, popped. *See* Popcorn.								

Tr *See* footnote on page 576.
* Values are calculated from a recipe

TABLE 1 (*Continued*)
MINERALS AND VITAMINS IN FOODS

List	Wt	Minerals: Ca Mg	Minerals: P Mg.	Minerals: Fe Mg	Vitamins: Vitamin A I U.	Vitamins: Thiamine Mg.	Vitamins: Riboflavin Mg.	Vitamins: Niacin Mg.	Vitamins: Ascorbic Acid Mg
Cookies:									
Assorted, plain	25	6	16	.2	0	.01	.01	.1	0
Butterscotch	25	11	22	.5	22	05	03	.3	0
Molasses	25	25	17	.8	24	.05	04	.4	0
Oatmeal	25	12	35	.5	27	.06	04	2	0
Sugar	20	5	12	.2	25	03	03	.2	0
Corn:									
Cooked	100	5	52	6	390†	.11	10	1 4	8
Canned									
Cream style	100	4	56	.6	113†	03	05	1 0	5
Whole kernel	100	4	50	.6	130†	03	05	.9	5
Corn bread or muffins made with									
Whole ground corn meal	100	141	216	1.7	130‡	.15	.18	.8	0
Enriched, degermed corn meal	100	139	155	1 9	130§	17	.23	1.3	0
Cornflakes	100	5	42	1.8	0	42	07	2.1	0
	25	2	12	.5	0	.12	02	6	0
Corn and soy shreds	100	85	184	4.2	0	67	14	2.1	0
	25	24	52	1.2	0	.19	04	6	0
Corn grits:									
Unenriched, cooked	100	1	10	.1	Tr	02	01	.2	0
Enriched, cooked	100	1	10	.3	Tr.	.04	03	.4	0
Corn meal:									
Unenriched, cooked	100	1	14	.2	40†	02	01	1	0
Enriched,cooked	100	1	14	.4	40†	.06	.04	.5	0
Corn pops	25	3	8	.5		.12	.05	.6	0

Tr *See* footnote on page 576
† Vitamin A based on yellow corn white corn contains only a trace.
‡ Based on recipe using white corn meal: If yellow, the vitamin A value is 334 I.U.
§ Based on recipe using white corn meal If yellow, the vitamin A value is 255 I.U.

TABLE 1 (*Continued*)
COMPOSITION OF FOODS EDIBLE PORTION

FOOD AND DESCRIPTION	Wt Gm.	Approximate Measure	Food Energy Cal.	Protein Gm	Fat Gm	CARBOHYDRATE Total Gm	CARBOHYDRATE Fiber Gm	Water Gm.
Cowpeas, immature seeds, cooked	100	⅝ c.	94	7	1	16		75
Crabs, Atlantic and Pacific, hard shell, *canned or cooked*, meat only	100	3½ ozs.	104	17	3	1		77
Crackers·								
Graham	14	2 medium	55	1	1	10	.1	1
Saltines	8	2 crackers	34	1	1	6	Tr.	1
Soda, plain or oyster crackers	1	2 crackers, 2½-in. square or 10 oyster crackers	43	1	1	7	Tr.	1
Cranberries·								
Raw	100	1 c.	48	Tr.	1	11	1.4	87
Sauce, sweetened, canned or cooked	100	⅓ c scant	198	Tr	Tr.	51	.4	48
Cream.								
Light, table or coffee	100	½ c. scant	204	3	20	4	0	73
	15	1 tbsp.	30	Tr.	3	1	0	11
Heavy or whipping	15	1 tbsp.	49	Tr.	5	1	0	9
Cucumbers, raw	100	½ of 7-8 in. cucumber	12	1	Tr.	3	.5	96
Currants, red, raw	100	1 c.	55	1	Tr	14	4 0	84
Custard, baked*	100	½ c scant	114	5	5	11	0	77
Pudding								
Canned, strained	100	½ c.	108	3	3	18	.1	75
Infant food	30	1 oz	31	1	1	5	Tr.	23
Dandelion greens, raw or cooked	100	½ c	44	3	1	9	1.8	86
Dates, "fresh" and dried	100	⅝ c. pitted	284	2	1	75	2 4	20

Tr. *See* footnote on page 576
* Values are calculated from a recipe

TABLE 1 (*Continued*)
MINERALS AND VITAMINS IN FOODS

List	Wt.	Minerals: Ca Mg	Minerals: P Mg	Minerals: Fe Mg	Vitamins: Vitamin A I U	Vitamins: Thiamine Mg	Vitamins: Riboflavin Mg	Vitamins: Niacin Mg	Vitamins: Ascorbic Acid Mg.
Cowpeas, immature seeds, cooked	100	37	182	2 5	390	.29	08	.8	20
Crabs, canned or cooked	100	45	182	9		(05)	(06)	(2 5)	
Crackers.									
Graham	14	3	28	3	0	04	.02	.2	0
Saltines	8	2	7	.1	0	Tr	Tr	1	0
Soda, plain or oyster crackers	11	2	11	.1	0	01	.01	.1	0
Cranberries:									
Raw	100	14	11	6	40	(03)	(02)	.1	12
Sauce, canned or cooked	100	(8)	(7)	(3)	(30)	(02)	(02)	(.1)	2
Cream.									
Light	100	97	77	1	830	03	14	1	1
	15	15	12	0	120	Tr	.02	Tr	Tr
Heavy	15	12	9	0	220	Tr	02	Tr	Tr
Cucumbers, raw	100	10	21	3	0	03	04	.2	8
Currants, red, raw	100	36	33	9	120	04			36
Custard, baked	100	114	119	.5	340	05	.20	1	Tr.
Pudding									
Canned, strained	100	92	82	3	220	02	12	.1	1
Infant food	30	26	23	1	60	Tr	04	Tr	Tr.
Dandelion greens									
Raw	100	187	70	3 1	13 650	.19	14	(8)	36
Cooked	100	187	70	3 1	15,170	.13	.12	(7)	16
Dates	100	72	60	2.1	60	09	10	2.2	0

Tr *See* footnote on page 574
Note Parentheses indicate imputed value.

TABLE 1 (*Continued*)
COMPOSITION OF FOODS EDIBLE PORTION

FOOD AND DESCRIPTION	Wt. Gm.	Approximate Measure	Food Energy Cal	Protein Gm.	Fat Gm.	CARBOHYDRATE Total Gm.	CARBOHYDRATE Fiber Gm.	Water Gm.
Doughnuts, cake type	100	3 doughnuts	425	7	21	53	.2	19
Eels, raw	100	3½ ozs.	162	19	9	0	0	72
Eggplant, raw	100	3½ ozs.	24	1	Tr.	6	.9	93
Eggs, fresh, stored or frozen:								
Raw or cooked								
Whole	100	2 medium	162	13	12	1	0	74
	54	1 medium	77	6	6	Tr.	0	38
White	100	3 medium	50	11	0	1	0	89
	31	1 medium	15	3	0	Tr.	0	27
Yolk	100	6 medium	361	16	32	1	0	49
	17	1 medium	61	3	5	Tr.	0	8
Cooked, omelet or scrambled*	100	made with 2 small eggs	171	11	13	2	0	73
Dried, whole	100	1 c.	592	47	42	3	0	5
Endive or escarole, raw	100	3½ ozs.	20	2	Tr.	4	.8	93
Evaporated milk. *See* milk								
Farina.								
Unenriched, cooked*	100	½ c. scant	44	1	Tr.	9	0	89
Enriched, cooked	100	½ c. scant	44	1	Tr.	9	0	89
Fats, cooking (vegetable fat)	100	½ c.	884	0	100	0	0	0
	12.5	1 tbsp.	110	0	13	0	0	0
Figs:								
Raw	100	3 small	79	1	Tr.	20	1.7	78
Canned, syrup pack, solids and liquid	100	3 figs and 2 tbsp. syrup	113	1	Tr.	30	.9	69
Dried	100	5 figs	270	4	1	68	5.8	24
Fig Bars	100	4 large	350	4	5	76	1.7	14

Tr *See* footnote on page 576.
* Values are calculated from a recipe

TABLE 1 (*Continued*)
MINERALS AND VITAMINS IN FOODS

List	Wt.	Minerals: Ca Mg	Minerals: P Mg	Minerals: Fe Mg	Vitamins: Vitamin A I U	Vitamins: Thiamine Mg	Vitamins: Riboflavin Mg.	Vitamins: Niacin Mg.	Vitamins: Ascorbic Acid Mg.
Doughnuts	100	73	286	(7)	140	16	13	1.2	0
Eels	100	18	202	.7	1,800	.28	.37	1.4	
Eggplant	100	15	37	.4	30	04	.05	.6	5
Eggs, hen, fresh, stored, frozen									
Raw or cooked									
Whole	100	54	210	2.7	1,140	10	.29	.1	0
	54	26	101	1.3	550	05	14	Tr.	0
White	100	6	17	.2	0	0	.26	(1)	0
	31	2	5	1	0	0	08	Tr.	0
Yolk	100	147	586	7.2	3,210	.27	35	Tr.	0
	17	25	100	1.2	550	05	.06	Tr	0
Cooked, omelet or scrambled	100	81	194	2 1	1,040	.08	.27	.1	0
Dried, whole	100	190	767	8.8	3,740	34	1 06	.2	0
Endive or escarole	100	79	56	1 7	3,000	07	12	4	11
Evaporated milk *See* milk.									
Farina:									
Unenriched, cooked	100	3	13	.1	0	.01	01	1	0
Enriched, cooked	100	3	13	.2	0	04	.03	.2	0
Fats, cooking (vegetable fat)	100	0	0	0	0	0	0	0	0
	12.5	0	0	0	0	0	0	0	0
Figs:									
Raw	100	54	32	6	80	.06	05	.5	2
Canned, syrup pack	100	35	21	.4	50	.03	03	4	Tr
Dried	100	186	111	3 0	80	.16	.12	1 7	0
Fig bars	100	69	69	1.3	0	.02	06	.9	0

Tr *See footnote on page 574.*
Note Parentheses indicate imputed value.

TABLE 1 (*Continued*)
COMPOSITION OF FOODS EDIBLE PORTION

Food and Description	Wt. Gm.	Approximate Measure	Food Energy Cal.	Protein Gm.	Fat Gm.	Carbohydrate Total Gm	Carbohydrate Fiber Gm.	Water Gm.
Fish:								
Bluefish								
Raw	100	3½ ozs.	124	21	4	0	0	75
Baked	100	3½ ozs.	155	27	4	0	0	69
Fried	100	3½ ozs.	205	23	10	5	0	61
Cod.								
Raw	100	3½ ozs.	74	17	Tr.	0	0	83
Dried	100	3½ ozs	375	82	3	0	0	12
Flounder, raw	100	3½ ozs.	68	15	1	0	0	83
Haddock·								
Raw	100	3½ ozs.	79	18	Tr.	0	0	81
Fried	100	3½ ozs.	158	19	6	7		67
Halibut.								
Raw	100	3½ ozs.	126	19	5	0	0	75
Broiled	100	3½ ozs.	182	26	9	0	0	64
Herring·								
Atlantic, raw	100	3½ ozs.	191	18	13	0	0	67
Pacific, raw	100	3½ ozs.	94	17	3	0	0	80
Smoked, kippered	100	3½ ozs.	211	22	13	0	0	61
Mackerel·								
Atlantic:								
Raw	100	3½ ozs.	188	19	12	0	0	68
Canned	100	3½ ozs.	182	19	11	0	0	66
Pacific, canned	100	3½ ozs	180	21	10	0	0	66
Salmon								
Raw Pacific, Chinook or King	100	3½ ozs	223	17	17	0	0	63
Pacific, broiled or baked	100	3½ ozs.	170	28	6	Tr.	0	65
Canned.								
Chinook or King	100	3½ ozs.	203	20	13	0	0	65
Pink or humpback	100	3½ ozs.	143	21	6	0	0	70
Sockeye or red	100	3½ ozs	173	20	10	0	0	67
Sardines.								
Atlantic type, canned in oil, drained solids	100	3½ ozs.	214	26	11	1		57
Pacific type,								
Pilchards								
Natural pack	100	3½ ozs	200	18	14	1	0	65
Tomato sauce	100	3½ ozs	216	18	15	2	.2	63

Tr See footnote on page 576.

TABLE 1 (*Continued*)
MINERALS AND VITAMINS IN FOODS

List	Wt	Minerals			Vitamins				
		Ca Mg	P Mg	Fe Mg.	Vitamin A I.U.	Thiamine Mg	Riboflavin Mg	Niacin Mg.	Ascorbic Acid Mg
Fish:									
Bluefish									
Raw	100	23	243	6		12	(09)	1 9	
Baked	100	23	293	.7		.12	.11	2.2	
Fried	100	19	243	6		11	11	2 1	
Cod									
Raw	100	10	194	.4	0	06	.09	2 2	2
Dried	100	(50)	891	3 6	0	08	45	10 9	0
Flounder, raw	100	61	195	.8		06	05	1.7	
Haddock									
Raw	100	23	197	.7		.05	08	2 4	
Fried	100	18	182	6		04	09	2 6	
Halibut									
Raw	100	13	211	.7	440	07	06	9 2	
Broiled	100	14	267	.8		.06	07	10.5	
Herring									
Atlantic, raw	100		256	1.1	110	02	15	3 4	
Pacific, raw	100				100	02	.22	(2 2)	
Smoked, kippered	100	66	254	(1 4)	0	Tr	.28	(2.9)	
Mackerel									
Atlantic									
Raw	100	5	239	1.0	(450)	15	.35	8 4	
Canned	100	185	274	2 1	430	06	.21	5 8	
Pacific, canned	100	260	288	2.2	30	03	33	8.8	
Salmon									
Raw Pacific	100		(289)	(9)	310	.10	.23	7.2	9
Cooked Pacific	100		(417)	(1.2)		.10	.28	8.1	
Canned †									
Chinook, King	100	154	289	9	230	.03	14	7.3	0
Pink, humpback	100	187	286	.8	70	03	18	8 0	0
Sockeye, red	100	259	344	1.2	230	04	16	7.3	0
Sardines									
Atlantic type, drained solids	100	386	586	2.7	220	.02	.17	4 8	0
Pacific type									
Natural pack	100	(351)	(168)	4 1	(30)	(01)	(.30)	(7 4)	0
Tomato sauce	100	351	168	4.1	30	01	.27	5.3	0

Tr See footnote on page 576
Note Parentheses indicate imputed value.
† If bones are discarded, calcium content would be much lower Bones equal about 2 per cent of total contents of can.

TABLE 1 (*Continued*)
COMPOSITION OF FOODS EDIBLE PORTION

FOOD AND DESCRIPTION	Wt. Gm.	Approximate Measure	Food Energy Cal.	Protein Gm.	Fat Gm.	Carbohydrate Total Gm.	Carbohydrate Fiber Gm.	Water Gm.
Fish (Continued)								
Shad, raw	100	3½ ozs.	168	19	10	0	0	70
Swordfish								
Raw	100	3½ ozs	118	19	4	0	0	76
Broiled	100	3½ ozs.	178	27	7	0	0	65
Tuna fish, drained solids	100	3½ ozs	198	29	8	0	0	60
Frog legs, raw	100	3½ ozs.	73	16	Tr.	0	0	82
Fruit cocktail, canned, solids and liquids	100	½ c. scant	70	Tr.	Tr.	19	.4	81
Gelatin, dry:								
Plain	100	½ c.	335	86	Tr.	0	0	13
	10	1 tbsp	34	9	0	0	0	1
Dessert powder	90	3-oz. pkg.	324	8	Tr.	76	0	1
Gelatin dessert,* ready to serve.								
Plain	100	½ c heaping	65	2	0	15	0	83
With fruit added	100	½ c. heaping	71	1	Tr.	18	.2	81
Gingerbread*	100	2 pieces, 2x2x2 in.	327	4	12	52	.1	30
Grapefruit:								
Raw	100	½ small	40	1	Tr.	10	.3	89
Canned in syrup, solids and liquid	100	½ c. scant	72	1	Tr	19	.2	80
Grapefruit juice:								
Fresh or frozen reconstituted	100	½ c. scant	36	1	Tr.	9	.1	90
Canned.								
Unsweetened	100	½ c. scant	38	1	Tr.	10	.1	89
Sweetened	100	½ c. scant	52	1	Tr.	14	.1	85
Grapefruit-orange juice blend, canned or frozen reconstituted								
Unsweetened	100	½ c. scant	40	1	Tr.	10	1	89
Sweetened	100	½ c scant	52	1	Tr.	14	.1	85

Tr. *See footnote on page 576*
* Values are calculated from a recipe.

TABLE I (*Continued*)
MINERALS AND VITAMINS IN FOODS

List	Wt.	Minerals Ca Mg	Minerals P Mg.	Minerals Fe Mg	Vitamins Vitamin A I.U.	Vitamins Thiamine Mg.	Vitamins Riboflavin Mg	Vitamins Niacin Mg.	Vitamins Ascorbic Acid Mg.
Fish (*Continued*)									
Shad, raw	100		260	.5		(15)	.24	(8 4)	
Swordfish									
Raw	100	19	195	.9	1,580	.05	.05	9 1	
Broiled	100	20	251	1.1	2,300	.05	.06	10.3	0
Tuna fish, drained solids	100	(8)	(351)	(1 4)	80	.05	12	12.8	0
Frog legs, raw	100	18	147	1.1	0	.14	.25	1.2	.
Fruit cocktail, canned	100	9	12	.4	160	.01	.01	.4	2
Gelatin, dry:									
Plain	100	0	0	0	0	0	0	0	0
	10	0	0	0	0	0	0	0	0
Dessert powder	100	0	0	0	0	0	0	0	0
Gelatin dessert, ready to serve:									
Plain	100	0	0	0	0	0	0	0	0
With fruit	100	6	11	.3	110	.03	.02	.2	3
Gingerbread	100	114	71	2.5	100	.04	.08	1.0	0
Grapefruit:									
Raw	100	22	18	.2	Tr	.04	.02	.2	40
Canned in syrup, solids and liquids	100	13	14	.3	Tr.	03	.02	.2	30
Grapefruit juice:									
Fresh or frozen	100	8	13	.3	Tr.	04	02	.2	40
Canned, unsweetened or sweetened	100	8	12	.3	Tr.	.03	.02	.2	35
Grapefruit-orange juice blend, canned or frozen, unsweetened or sweetened	100	9	15	.3	40	.05	.02	.2	38

Tr See footnote on page 576.
Note Parenthesis indicate imputed value.

TABLE 1 (*Continued*)
COMPOSITION OF FOODS EDIBLE PORTION

FOOD AND DESCRIPTION	Wt. Gm	Approximate Measure	Food Energy Cal.	Protein Gm.	Fat Gm.	CARBOHYDRATE Total Gm	CARBOHYDRATE Fiber Gm.	Water Gm.
Grapes, raw:								
American type (slip skin) as Concord, Delaware, Niagara and Scuppernong	100	1 bunch, 3½x3 in	70	1	1	15	.5	82
European type (adherent skin) as Malaga, muscat, sultanina, Thompson seedless and Tokay	100	⅔ c.	66	1	Tr.	17	.5	82
Grape juice, bottled, commercial	100	3½ ozs.	67	Tr.	0	18		81
Guavas, common, raw	100	1 large	70	1	1	17	5.5	81
Heart:								
Beef, lean, raw	100	3½ ozs.	108	17	4	1	0	78
Calf, canned, strained (infant food)	30	1 oz.	23	4	1	Tr.	0	22
Chicken, raw	100	3½ ozs.	157	21	7	2	0	70
Pork, raw	100	3½ ozs.	117	17	5	Tr	0	77
Honey, strained or extracted	21	1 tbsp.	62	Tr	0	17		4
Honeydew melon, raw	100	wedge 1½x7 in.	32	1	0	7	.4	91
Ice cream, plain	100	¾ c.	207	4	13	21	0	62
	62	1 container, 3½ fluid ozs.	129	3	8	13	0	37
Jams, marmalades, preserves	20	1 tbsp	55	Tr.	Tr.	14	.1	6
Jellies	20	1 tbsp.	50	0	0	13	0	7
Kale:								
Cooked, fresh or frozen	100	1 c.	40	4	1	7	1.2	87
Frozen, raw	100	1 c.	31	3	1	5	.9	90

Tr *See* footnote on page 576.

TABLE 1 (*Continued*)
MINERALS AND VITAMINS IN FOODS

LIST	Wt.	Minerals: Ca Mg.	Minerals: P Mg	Minerals: Fe Mg.	Vitamins: Vitamin A I U	Vitamins: Thiamine Mg.	Vitamins: Riboflavin Mg.	Vitamins: Niacin Mg.	Vitamins: Ascorbic Acid Mg
Grapes, raw									
American type (slip skin)	100	17	21	.6	80	06	.04	.2	4
European type (adherent skin)	100	17	21	.6	80	06	04	.2	4
Grape juice, bottled	100	10	10	.3		04	05	(.2)	Tr.
Guavas	100	30	29	7	250	07	.04	1.2	302
Heart:									
Beef, raw	100	9	203	4 6	30	.58	.89	7.8	6
Calf (infant food)	30	3	43	1.0		02	.23	1.3	
Chicken, raw	100	23	142	1 7	30	12	.91	5.2	6
Pork, raw	100	35	132	2.7	30	43	1.24	6 0	6
Honey	21	1	3	.2	0	Tr	.01	Tr.	1
Honeydew melon	100	(17)	(16)	(4)	40	.05	03	.2	23
Ice cream, plain	100	123	99	.1	520	.04	.19	.1	1
	62	76	61	.1	320	03	.12	.1	1
Jams, etc.	20	2	2	1	Tr	Tr.	Tr	Tr.	1
Jellies	20	(2)	(2)	(1)	Tr	Tr	Tr.	Tr.	1
Kale:									
Cooked	100	225	62	2.2	8 350	07	.23	1 7	51
Frozen, raw	100	134	50	1.1	8,150	03	.18	.8	64

Tr *See footnote on page 578.*
Note. Parentheses indicate imputed value.

TABLE 1 (*Continued*)
COMPOSITION OF FOODS EDIBLE PORTION

FOOD AND DESCRIPTION	Wt. Gm.	Approximate Measure	Food Energy Cal	Protein Gm.	Fat Gm.	CARBOHYDRATE Total Gm.	CARBOHYDRATE Fiber Gm.	Water Gm.
Kidneys, raw.								
Beef	100	3½ ozs.	141	15	8	1	0	75
Pork	100	3½ ozs.	114	16	5	1	0	77
Sheep	100	3½ ozs.	105	17	3	1	0	78
Kohlrabi:								
Raw	100	⅔ c. diced	30	2	Tr.	7	1.1	90
Cooked	100	⅝ c.	30	2	Tr	7	1.1	90
Lamb:								
Rib chop, cooked	100	3½ ozs	418	24	35	0	0	40
Shoulder roast cooked	100	3½ ozs.	342	21	28	0	0	50
Leg roast, cooked	100	3½ ozs	274	24	19	0	0	56
Canned, strained (infant food)	30	1 oz.	30	4	1	0	0	24
Lard	100	½ c.	902	0	100	0	0	0
	14	1 tbsp	126	0	14	0	0	0
Lemons	100	1 medium, 2¼x2 in.	32	1	1	9	.9	89
Lemon juice, fresh and canned unsweetened	100	½ c. scant	24	Tr.	Tr.	8	0	91
Lentils, dry, split	100	3½ ozs	339	24	1	60	1.7	12
Lettuce, raw, headed and other types	100	4 large leaves	15	1	Tr.	3	.6	95
Limes	100	2 medium	37	1	Tr.	12	(.9)	86
Lime juice, fresh	100	½ c. scant	24	Tr.	0	8	0	91
Liver.								
Beef								
Raw	100	3½ ozs	136	20	3	6	0	70
Fried	100	3½ ozs.	208	24	8	10	0	57
Calf, raw	100	3½ ozs	141	19	5	4	0	71
Chicken, raw	100	3½ ozs.	141	22	4	3	0	70
Pork, raw	100	3½ ozs	134	20	5	2	0	72
Sheep or lamb, raw	100	3½ ozs.	136	21	4	3	0	71

Tr. *See* footnote on page 576.
Note Parentheses indicate imputed value.

TABLE 1 (*Continued*)
MINERALS AND VITAMINS IN FOODS

List	Wt.	Minerals Ca Mg	Minerals P Mg	Minerals Fe Mg	Vitamins Vitamin A I U.	Vitamins Thiamine Mg	Vitamins Riboflavin Mg	Vitamins Niacin Mg.	Vitamins Ascorbic Acid Mg.
Kidneys, raw.									
Beef	100	9	221	7 9	1,150	.37	2 55	6 4	13
Pork	100	11	246	8 0	130	.58	1 74	9 8	13
Sheep	100	13	237	9.2	(1,150)	.51	2 42	7 4	13
Kohlrabi:									
Raw	100	46	50	6	Tr	06	.05	.2	61
Cooked	100	46	50	6	Tr	.04	.04	.2	37
Lamb·									
Rib chop, cooked	100	11	200	3 0	0	14	.26	5 6	0
Shoulder roast, cooked	100	9	188	2 6	0	12	22	4.6	0
Leg roast, cooked	100	10	257	3 1	0	.14	.25	5 1	0
Canned, strained	30	5	48	.7	0	01	07	1 1	0
Lard	100	0	0	0	0	0	0	0	0
	14	0	0	0	0	0	0	0	0
Lemons	100	40	22	.6	0	04	Tr.	.1	50
Lemon juice, unsweetened	100	14	11	1	0	04	Tr.	.1	50
Lentils, split	100	34	292	7.4	570	.56	.24	2 2	5
Lettuce:									
Headed	100	22	25	.5	540	04	08	.2	8
Leaf type	100	62	20	1 1	1,620	04	.08	.2	18
Limes	100	(40)	(22)	(6)	0	(04)	Tr	(.1)	27
Lime juice	100	(14)	(11)	(1)	0	(04)	Tr.	(1)	27
Liver									
Beef									
Raw	100	7	358	6 6	43,900	.26	3 33	13 7	31
Fried	100	8	486	7 8	53 500	26	3 96	14 8	31
Calf, raw	100	6	343	10 6	22,500	.21	3 12	16 1	36
Chicken, raw	100	16	240	7 4	32,200	.20	2.46	11.8	20
Pork, raw	100	10	362	18 0	14,200	.40	2 98	16 7	23
Sheep or lamb, raw	100	6	364	12.6	50,300	40	3.28	16 9	33

Tr See footnote on page 576
Note Parentheses indicate imputed value

TABLE 1 (*Continued*)
COMPOSITION OF FOODS EDIBLE PORTION

FOOD AND DESCRIPTION	Wt. Gm.	Approximate Measure	Food Energy Cal.	Protein Gm.	Fat Gm.	CARBOHYDRATE Total Gm.	Fiber Gm.	Water Gm.
Liver, canned, strained (infant food)	30	1 oz.	30	5	1	Tr.	0	23
Lobster:								
Raw	100	3½ ozs meat	88	18	2	1	0	79
Canned	100	3½ ozs.	92	18	1	Tr.	0	77
Loganberries, raw	100	⅔ c.	62	1	1	15	1.4	83
Macaroni:								
Unenriched.								
Dry	100	¾ c. elbow type	377	13	1	77	.4	9
Cooked*	100	⅔ c. elbow type	149	5	1	30	.2	61
Enriched·								
Dry	100	¾ c. elbow type	377	13	1	77	.4	9
Cooked*	100	⅔ c. elbow type	149	5	1	30	.2	61
Macaroni and cheese, baked*	100	½ c.	211	8	11	20	.1	58
Mangos, raw	100	½ medium	66	1	Tr	17	1 0	81
Margarine, fortified	100	½ c. scant	720	1	81	Tr.	0	16
	14	1 tbsp.	101	Tr.	11	Tr.	0	2
Marmalades. *See* Jams, marmalades, preserves.								
Mayonnaise. *See* Salad dressings								
Meat. *See* Beef, Lamb, Pork, Veal.								
Milk, cow:								
Fluid (pasteurized and raw)								
Whole	100	½ c. scant	68	3 5	4	5	0	87
	244	1 c.	166	8 5	10	12	0	212
Nonfat (skim)	100	½ c. scant	36	3 5	Tr.	5	0	91
	246	1 c.	87	8 6	Tr.	13	0	222

Tr. See footnote on page 576.
* Values are calculated from a recipe.

TABLE 1 (*Continued*)
MINERALS AND VITAMINS IN FOODS

List	Wt	Minerals			Vitamins				
		Ca Mg	P Mg	Fe Mg	Vitamin A I U.	Thiamine Mg	Riboflavin Mg	Niacin Mg	Ascorbic Acid Mg.
Liver (infant food)	30	7	79	2.0	5,440	01	61	1.8	
Lobster:									
Raw	100	61	184	6		(13)	06	(1.9)	
Canned	100	65	192	.8		(03)	.07	(2.2)	
Loganberries	100	35	19	1.2	(200)	(03)	(07)	(3)	24
Macaroni:									
Unenriched									
Dry	100	22	165	1 5	0	.09	.06	2 0	0
Cooked	100	9	65	.6	0	.02	02	.5	0
Enriched									
Dry	100	22	165	2.9†	0	88†	37†	6 0†	0
Cooked	100	9	65	1.1	0	17	.10	1 4	0
Macaroni and cheese:									
Unenriched	100	191	169	.5	450	.03	.16	.4	Tr.
Enriched	100	191	169	.7	450	.10	.20	.9	Tr.
Mangos	100	9	13	.2	6,350	06	06	.9	41
Margarine	100	20	16	0	3,300				0
	14	3	2	0	460				0
Marmalades See Jams, marmalades, preserves.									
Mayonnaise. See Salad dressings									
Meat. See Beef, Lamb, Pork, Veal.									
Milk, cow:									
Fluid (pasteurized and raw).									
Whole	100	118	93	.1	(160)	.04	17	.1	1
	244	288	227	.2	(390)	.09	.42	.3	3
Nonfat	100	123	97	.1	Tr.	.04	.18	.1	1
	244	303	239	.2	(10)	09	.44	.3	3

Tr *See footnote on page 578*

Note Parentheses indicate imputed value

† Iron, thiamine, riboflavin and niacin are based on the minimum level of enrichment specified under the Food, Drug and Cosmetic Act.

TABLE 1 (*Continued*)
COMPOSITION OF FOODS EDIBLE PORTION

FOOD AND DESCRIPTION	Wt. Gm	Approximate Measure	Food Energy Cal	Protein Gm.	Fat Gm.	Carbohydrate Total Gm.	Carbohydrate Fiber Gm.	Water Gm.
Milk, cow (*Continued*)								
Canned.								
Evaporated (unsweetened)	100	⅖ c scant	138	7	8	10	0	74
Condensed (sweetened)	100	⅓ c.	320	8	8	55	0	27
Dried								
Whole	100	1 c. scant	492	26	27	38	0	4
	8	1 tbsp.	39	2	2	3	0	Tr.
Nonfat solids (skim)	100	1 c. scant	362	36	1	52	0	4
	7½	1 tbsp	28	3	Tr	4	0	Tr.
Malted†								
Dry powder	30	1 oz.	115	4	2	20	0	Tr.
Beverage	270	1 c	281	12	12	32	0	210
Chocolate flavored*	100	⅖ c. scant	74	3	2	11	0	83
	250	1 c.	185	8	6	27	0	207
Milk, goat, fluid	100	⅖ c scant	64	3	4	5	0	87
	244	1 c.	164	8	10	11	0	212
Molasses, cane:								
First extraction or light	100	⅓ c.	252			65		24
Second extraction or medium	100	⅓ c	232			60		24
Third extraction or *blackstrap*	100	⅓ c.	213			55		24
Muffins, made with enriched flour*	100	2 muffins, 2⅜-in diam.	280	8	8	42	.1	37
Mung bean sprouts, raw	100	1 c.	23	3	Tr.	4	.7	92
Mushrooms, canned, solids and liquid	100	½ c.	11	1	Tr.	4		93
Mustard greens:								
Cooked	100	⅗ c.	22	2	Tr.	4	8	92
Frozen	100	⅗ c.	20	2	Tr.	3	.9	93

Tr *See* footnote on page 578
* Values are calculated from a recipe
† Based on unfortified products

TABLE 1 (*Continued*)
MINERALS AND VITAMINS IN FOODS

List	Wt	Minerals Ca Mg.	P Mg	Fe Mg	Vitamins Vitamin A I U.	Thiamine Mg	Riboflavin Mg.	Niacin Mg.	Ascorbic Acid Mg
Milk, cow (*Continued*)									
Canned									
Evaporated	100	243	195	.2	400	05	36	.2	1
Condensed	100	273	228	.2	(430)	05	39	.2	1
Dried.									
Whole	100	949	728	.6	1,400	30	1 46	.7	6
	8	76	58	Tr.	110	02	12	.1	1
Nonfat solids	100	1,300	1,030	.8	(40)	35	1 96	1 1	7
	7½	98	77	Tr.	Tr	03	15	.1	1
Malted									
Dry powder	30	81	107	6	290	09	15		0
Beverage	270	364	332	.8	680	18	.56		3
Chocolate flavored	100	109	91	.1	90	03	16	1	1
	250	272	228	.2	230	08	40	.2	2
Milk, goat	100	129	106	.1	(160)	04	.11	.3	1
	244	315	259	.2	(390)	10	26	7	2
Molasses, cane:									
Light	100	165	45	4 3		07	.06	.2	
Medium	100	290	69	6 0			.12	1.2	
Blackstrap	100	579	85	11 3		.12	.18	1 6	
Muffins, with enriched flour	100	206	191	1.6	100	18	.21	1.5	0
Mung bean sprouts	100	29	59	.8	10	07	09	.5	15
Mushrooms, canned	100	(7)	(90)	(8)	0	02	.25	2 0	
Mustard greens									
Cooked	100	220	38	2 9	7,180	.06	18	.7	45
Frozen, raw	100	115	45	1 6	6,000	04	.12	4	34

Tr *See footnote on page 576.*
Note Parentheses indicate imputed value

TABLE 1 (*Continued*)
COMPOSITION OF FOODS EDIBLE PORTION

Food and Description	Wt Gm.	Approximate Measure	Food Energy Cal.	Protein Gm.	Fat Gm	Carbohydrate Total Gm	Carbohydrate Fiber Gm.	Water Gm.
Noodles (containing egg), enriched, cooked*	100	⅝ c.	67	2	1	13	.1	84
Oat cereal, ready-to-eat (added vitamins and minerals)	100	4 c.	396	15	7	70	2.0	4
	25	1 c.	100	4	2	18	.4	1
Oatmeal or rolled oats:								
Cooked*	100	⅝ c.	63	2	1	11	.2	85
Precooked (infant food), dry	30	1 oz.	106	4	1	20	.5	2
Oils, salad or cooking	100	½ c.	884	0	100	0	0	0
	14	1 tbsp.	124	0	14	0	0	0
Okra, cooked	100	9 pods	32	2	Tr.	7	1.0	90
Olives, pickled								
Green	65	10 olives	72	1	7	2	.8	50
Ripe, Mission	65	10 olives	106	1	12	1	1.0	48
Onions:								
Mature								
Raw	100	1 onion, 2½-in. diam	45	1	Tr.	10	.8	88
Cooked	100	½ c	38	1	Tr.	9	.8	90
Young, green	100	12 small, without tops	45	1	Tr.	11	1.8	88
Oranges	100	1 small	45	1	Tr.	11	.6	87
Orange juice:								
Fresh	100	½ c. scant	44	1	Tr.	11	.1	88
Canned, unsweetened	100	½ c scant	44	1	Tr.	11	.1	88
Orange juice concentrate:								
Canned	100	3½ ozs.	229	4	1	58	.2	35
Frozen								
Undiluted	100	3½ ozs.	149	3	1	37	.2	58
Reconstituted	100	3½ ozs	47	1	Tr.	11	.1	88
Oysters, meat only, raw	100	5-8 medium	84	10	2	7		81

Tr See footnote on page 576
* Values are calculated from a recipe

TABLE 1 (*Continued*)
MINERALS AND VITAMINS IN FOODS

List	Wt.	Minerals			Vitamins				
		Ca Mg	P Mg	Fe Mg	Vitamin A I U.	Thiamine Mg.	Riboflavin Mg	Niacin Mg.	Ascorbic Acid Mg
Noodles, enriched, cooked	100	4	35	.5	30	14	.06	1 0	0
Oat cereal, ready-to-eat	100	160	350	4.1	0	.82	19	1 9	0
	25	40	88	1 0	0	.20	05	.5	0
Oatmeal									
Cooked	100	9	67	.7	0	10	.02	.2	0
Precooked (infant food)	30	225	226	8 9	0	36	.10	.7	0
Oils	100	0	0	0	0	0	0	0	0
	14	0	0	0	0	0	0	0	0
Okra, cooked	100	82	62	.7	740	06	.06	.8	20
Olives, pickled									
Green	65	48	9	.9	160	Tr			
Ripe, Mission	65	48	9	.9	40	Tr	Tr		.
Onions:									
Mature									
Raw	100	32	44	.5	50	03	.04	.2	9
Cooked	100	32	44	.5	50	02	.03	.2	6
Young	100	135	24	.9	(50)	(03)	(04)	(2)	24
Oranges	100	33	23	.4	190	08	03	.2	49
Orange juice,									
Fresh	100	19	16	2	(190)	08	03	.2	49
Canned, unsweetened	100	10	18	.3	(100)	.07	02	.2	42
Orange juice concentrate,									
Canned	100	61	89	1 6		.37	08	1 1	221
Frozen									
Undiluted	100	34	60	.5	20	.24	.05	.7	188
Reconstituted	100	9	16	1	5	.06	01	.2	47
Oysters	100	94	143	5 6	320	.15	.20	1.2	

Tr See footnote on page 676
Note Parentheses indicate imputed value

TABLE 1 (*Continued*)

COMPOSITION OF FOODS EDIBLE PORTION

Food and Description	Wt. Gm	Approximate Measure	Food Energy Cal.	Protein Gm	Fat Gm.	Carbohydrate Total Gm.	Carbohydrate Fiber Gm	Water Gm.
Oyster stew:*								
1 part oysters to 3 parts milk by volume	100	½ c. scant	91	5	5	5		83
Pancakes (griddle-cakes) *								
Wheat (home recipe), with enriched flour	100	4 cakes, 4 in diam.	218	7	9	27	.1	55
Buckwheat, with buckwheat pancake mix	100	4 cakes	176	6	8	21	.5	62
Papayas, raw	100	⅔ c., ½ in. cubes	39	1	Tr.	10	.9	89
Parsley, common, raw	3½	1 tbsp. chopped	1	Tr.	0	Tr.	Tr.	2
Parsnips, cooked	100	⅔ c	60	1	1	14	2.1	84
Peaches:								
Raw	100	1 peach, 2½x2 in. diam	46	1	Tr.	12	.6	87
Canned, solids and liquid.								
Water pack	100	½ c scant	27	1	Tr.	7	.3	92
Syrup pack	100	½ c scant	68	Tr.	Tr.	18	.4	81
Strained (infant food)	30	1 oz.	17	Tr.	Tr.	4	.1	25
Frozen, sliced	100	3½ ozs.	87	Tr.	Tr.	22	.4	77
Dried, sulfured:								
Uncooked	100	⅔ c.	265	3	1	69	3 5	24
Cooked, sugar added*	100	4-5 halves, 2 tbsp. fluid	120	1	Tr.	31	1.0	67
Peanuts, Virginia type, roasted, shelled	100	⅔ c	559	27	44	24	2 4	3
	9	1 tbsp. chopped	50	2	4	2	.2	Tr.
Peanut butter	100		576	26	48	21	2 0	2
	16	1 tbsp.	92	4	8	3	.3	Tr.

Tr *See footnote on page 576*

* Values are calculated from a recipe

TABLE 1 (*Continued*)
MINERALS AND VITAMINS IN FOODS

List	Wt	Minerals Ca Mg	P Mg	Fe Mg	Vitamins Vitamin A I U	Thiamine Mg	Riboflavin Mg	Niacin Mg.	Ascorbic Acid Mg
Oyster stew	100	117	110	1.5	280	06	.18	.4	.
Pancakes.									
Wheat with enriched flour	100	158	154	1.3	200	.18	.21	1.3	Tr.
Buckwheat	100	249	362	1.2	110	16	16	9	Tr
Papayas, raw	100	20	16	3	1,750	03	04	.3	56
Parsley	3½	7†	3	.2	290	Tr.	01	.1	7
Parsnips, cooked	100	57	80	.7	0	.06	.10	2	12
Peaches									
Raw	100	8	22	.6	880	.02	.05	9	8
Canned									
Water pack	100	5	14	.4	450	.01	02	.7	4
Syrup pack	100	5	14	.4	450	.01	02	.7	4
Strained	30	2	5	.3	180	01	01	.2	1
Frozen, sliced	100	4	13	.5	120	01	03	.7	40‡
Dried, sulfured									
Uncooked	100	44	126	6 9	3,250	01	20	5 4	19
Cooked, sugar added	100	12	35	1 9	900	Tr	05	1 4	4
Peanuts	100	74	393	1.9	0	.30	13	16 2	0
	9	7	35	.2	0	.03	01	1 5	0
Peanut butter	100	74	393	1 9	0	12	13	16 2	0
	16	12	63	3	0	02	02	2 6	0

Tr *See* footnote on page 574

† Calcium may not be available because of the presence of oxalic acid.

‡ Ascorbic acid added in processing

TABLE 1 (*Continued*)
COMPOSITION OF FOODS EDIBLE PORTION

Food and Description	Wt. Gm.	Approximate Measure	Food Energy Cal	Protein Gm.	Fat Gm.	Carbohydrate Total Gm.	Carbohydrate Fiber Gm.	Water Gm.
Pears:								
Raw	100	1 med. pear, 2½x2 in.	63	1	Tr.	16	1.4	83
Canned, solids and liquid:								
Water pack	100	½ c. scant	31	Tr.	Tr.	8	.7	91
Syrup pack	100	2 med halves	68	Tr.	Tr.	18	.8	81
Strained (infant food)	30	1 oz.	15	Tr.	Tr.	4	.3	26
Peas, green:								
Immature.								
Cooked fresh or frozen	100	⅔ c. drained	70	5	Tr.	12	2.2	82
Canned								
Solids and liquid	100	½ c scant	68	4	Tr.	13	1.4	82
Drained solids	100	⅔ c.	91	5	1	17	2.3	77
Strained (infant food)	30	1 oz.	14	1	Tr.	2	.3	26
Mature dry seeds, split	100	½ c.	344	25	1	62	1.2	10
Pecans	100	1 c. halves	696	9	73	13	2.2	3
	7½	1 tbsp. chopped	52	1	6	1	.2	Tr.
Peppers, green								
Raw	100	1 large	25	1	Tr.	6	1.4	92
Cooked, parboiled, then baked	100	1 large or 2 small	26	1	Tr.	6	1.6	92
Persimmons, Japanese, raw	100	1 medium	78	1	Tr.	20	1.9	78
Pickles:								
Dill, cucumber	100	1 large	11	1	Tr.	2	.4	93
Fresh, cucumber (as bread and butter pickles)	100	⅔ c.	70	1	Tr.	17		80
Sour, cucumber or mixed	100	⅔ c.	11	1	Tr.	2	.4	95
Sweet, cucumber or mixed	100	⅔ c.	108	1	Tr.	26		71

Tr *See* footnote on page 576

TABLE 1 (*Continued*)
MINERALS AND VITAMINS IN FOODS

List	Wt.	Minerals Ca Mg	P Mg	Fe Mg	Vitamins Vitamin A I U.	Thiamine Mg.	Riboflavin Mg.	Niacin Mg.	Ascorbic Acid Mg
Pears:									
Raw	100	13	16	.3	20	.02	.04	.1	4
Canned									
Water pack	100	8	10	.2	Tr	.01	.02	.1	2
Syrup pack	100	8	10	.2	Tr	01	.02	.1	2
Strained	30	3	4	(.1)	10	Tr.	01	.1	Tr.
Peas:									
Immature									
Cooked	100	22	122	1.9	720	.25	14	2 3	15
Canned									
Solids and liquid	100	25	67	1.8	540	11	.06	1.0	8
Drained solids	100	32	77	2.1	670	12	.06	1.0	9
Strained	30	5	18	.4	180	03	.02	.3	2
Mature, split	100	33	268	5.1	370	77	28	3 1	2
Pecans	100	74	324	2 4	50	72	11	9	2
	7½	6	24	2	Tr	05	01	1	Tr.
Peppers, green,									
Raw	100	11	25	.4	630	04	07	.4	120
Cooked	100	11	25	.4	740	04	07	4	99
Persimmons, raw	100	6	26	3	2,710	.05	05	Tr.	11
Pickles.									
Dill	100	25	20	1.2	310	Tr	06	Tr.	6
Fresh, as bread and butter pickles	100	32	27	1.8	180	02	04	Tr.	9
Sour	100	25	20	1.2	310	Tr	06	Tr	6
Sweet	100	16	18	1.3	110	0	02	Tr	7

Tr *See* footnote on page 576
Note Parentheses indicate imputed value

TABLE 1 (*Continued*)
COMPOSITION OF FOODS EDIBLE PORTION

FOOD AND DESCRIPTION	Wt Gm.	Approximate Measure	Food Energy Cal.	Protein Gm	Fat Gm	CARBOHYDRATE Total Gm	Fiber Gm	Water Gm.
Pies:		⅙ of 9-in pie						
Apple*	135		331	3	13	53	1 0	64
Blueberry*	135		291	3	9	51	1 0	71
Cherry*	135		340	3	13	55	.2	61
Custard or coconut custard	130		266	7	11	34	0	79
Lemon meringue	120		302	4	12	45	0	63
Mince*	135		341	3	9	62	.5	57
Pumpkin	130		263	6	13	34	.6	79
Pimientos, canned	38	1 medium	10	Tr.	Tr.	2	.2	34
Pineapple:								
Raw	100	⅔ c. diced	52	Tr	Tr.	14	.4	85
Canned, syrup pack, solids and liquid	100	1 med slice, 2 tbsp. juice	78	Tr.	Tr.	21	.3	78
Frozen, chunks	100	3½ ozs	86	Tr.	Tr.	22	.4	77
Pineapple juice, canned	100	½ c. scant	49	Tr	Tr	13	.1	86
Plums:								
All, excluding prunes, raw	100	2 medium	50	1	Tr.	13	.5	86
Italian prunes, canned, syrup pack, solids and liquid	100	½ c scant or 3 med prunes	76	Tr.	Tr.	20	.3	79
Popcorn, popped	14	1 c.	54	2	1	10	.3	1
Pork, fresh:								
Retail items, medium fat:								
Ham, cooked	100	3½ ozs.	400	24	33	0	0	42
Loin or chops, cooked	100	3½ ozs.	333	23	26	0	0	50
Miscellaneous lean cuts, raw	100	3½ ozs.	357	15	33	0	0	52

Tr. See footnote on page 576
* Values are calculated from a recipe.

TABLE 1 (*Continued*)
MINERALS AND VITAMINS IN FOODS

List	Wt.	Minerals Ca Mg	P Mg.	Fe Mg	Vitamins Vitamin A I U.	Thiamine Mg	Riboflavin Mg.	Niacin Mg.	Ascorbic Acid Mg.
Pies.									
Apple	135	9	32	.5	220	04	.02	.3	1
Blueberry	135	14	30	.7	160	.02	04	.3	5
Cherry	135	14	36	.5	520	04	02	.3	2
Custard or coconut custard	130	162	151	1 6	290	.07	.21	.4	0
Lemon meringue	120	24	61	6	210	04	.10	.2	1
Mince	135	22	54	3 0	10	09	05	.5	1
Pumpkin	130	70	105	1 0	2,480	.04	15	.4	0
Pimientos, canned	38	3	6	.6	870	01	.02	.1	36
Pineapple:									
Raw	100	16	11	.3	130	08	.02	.2	24
Canned, syrup pack	100	29	7	.6	80	07	02	.2	9
Frozen, chunks	100	9	4	.4	33	.10	.03	.3	8
Pineapple juice	100	15	8	5	80	05	02	.2	9
Plums.									
Raw	100	17	20	.5	350	.06	04	.5	5
Italian prunes, canned, syrup pack, solids and liquids	100	8	12	1.1	230	03	03	.4	1
Popcorn, popped	14	(2)	(39)	(4)	0	(05)	(02)	(3)	0
Pork, fresh, retail items									
Ham, cooked	100	11	238	3 1	0	53	.24	4 7	0
Loin or chops, cooked	100	11	235	3 0	0	.83	.24	5 0	0
Miscellaneous lean cuts, raw	100	8	157	2 2	0	.70	.17	3 8	0

Note. Parentheses indicate imputed value

TABLE 1 (*Continued*)
COMPOSITION OF FOODS EDIBLE PORTION

Food and Description	Wt. Gm	Approximate Measure	Food Energy Cal	Protein Gm.	Fat Gm.	Carbohydrate Total Gm.	Carbohydrate Fiber Gm.	Water Gm.
Pork:								
Cured								
Ham, smoked, medium fat, cooked	100	3½ ozs.	397	23	33	Tr.	0	39
Luncheon meat								
Boiled ham	100	3½ ozs.	302	23	23	0	0	48
Canned, spiced	100	3½ ozs.	289	15	24	2	.2	55
Salt pork, fat, raw	100	3½ ozs.	783	4	85	0	0	8
Canned, strained (infant food)	30	1 oz.	36	5	2	0	0	23
Potatoes:								
Cooked:								
Baked	100	1 medium	98	2	Tr.	23	.5	74
Boiled or steamed, peeled before cooking	100	1 medium	83	2	Tr.	19	.4	78
French Fried*	100	20 pieces, 2x½x½	393	5	19	52	1.1	20
Fried, raw	100	½ c.	282	4	14	36	.8	43
Hash-browned after holding overnight	100	½ c.	241	3	12	32	.7	51
Mashed, milk and butter added*	100	½ c.	123	2	6	16	.3	74
Dehydrated	100	3½ ozs.	357	7	1	82	2.2	7
Potato chips	20	10 med. or 7 large	108	1	7	10	.1	1
Potato flour	100	1 c sifted	357	7	1	82	2.2	7
Pretzels	5	5 small sticks	18	Tr	Tr.	4	Tr.	Tr.
Prunes:								
Dried, unsulfured								
Uncooked	100	½ c medium	268	2	1	71	1 6	24
Cooked, no sugar added	100	6 prunes, 2 tbsp. juice	125	1	Tr	33	.8	65
Cooked, sugar added	100	6 prunes, 2 tbsp. juice	165	1	Tr.	43	.6	55
Canned, strained, (infant food)	30	1 oz.	28	Tr.	Tr.	7	.2	22

Tr *See* footnote on page 576
* Values are calculated from a recipe.

TABLE 1 (*Continued*)

MINERALS AND VITAMINS IN FOODS

List	Wt	Minerals			Vitamins				
		Ca Mg	P Mg.	Fe Mg	Vitamin A I U.	Thiamine Mg	Riboflavin Mg.	Niacin Mg	Ascorbic Acid Mg.
Pork.									
Cured:									
Ham, smoked, cooked	100	10	166	2 9	0	.54	21	4.2	0
Luncheon meat:									
Boiled ham	100	9	92	2 7	0	1.01	.26	5 1	0
Canned, spiced	100	9	161	2.2	0	32	.22	2 8	0
Salt pork	100	Tr.	Tr.	6	0	(18)	(04)	(9)	0
Canned (infant food)	100	4	51	.5	0	.10	08	1 3	0
Potatoes:									
Cooked									
Baked	100	13	66	.8	20	.11	.05	1.4	17†
Boiled or steamed	100	11	56	.7	20	.09	03	1.0	14
French fried	100	30	152	1.9	50	18	.11	3 3	28
Fried, raw	100	21	106	1 3	40	.12	.08	2 3	19
Hash-browned	100	18	93	1 2	30	08	06	1.7	7
Mashed with milk, butter	100	27	59	.6	260	.08	.05	8	7
Dehydrated	100	25	88	4 0	40	.30	11	4 5	23
Potato chips	20	(6)	(30)	(4)	(10)	(04)	02	6	2
Potato flour	100	25	88	4 0	40	30	.11	4 5	23
Pretzels	5	1	4	Tr.	0	Tr.	Tr	Tr.	0
Prunes.									
Dried									
Uncooked	100	54	85	3 9	1,890	10	16	1 7	3
Cooked, no sugar added	100	25	40	1 8	890	.03	.08	.8	1
Cooked, sugar added	100	22	34	1.5	750	03	06	6	1
Canned (infant food)	30	7	8	.4	210	01	01	.2	1

[illegible]

TABLE 1 (*Continued*)
COMPOSITION OF FOODS EDIBLE PORTION

FOOD AND DESCRIPTION	Wt. Gm.	Approximate Measure	Food Energy Cal.	Protein Gm.	Fat Gm	CARBOHYDRATE Total Gm	Fiber Gm.	Water Gm.
Prune juice, canned	100	⅜ c. scant	71	Tr.	0	19	..	80
Prune whip*	100	¾ c.	148	3	Tr.	37	.7	59
Pumpkin, canned	100	⅜ c.	33	1	Tr.	8	1.2	90
Radishes, raw	40	4 small	4	Tr.	Tr.	1	.1	37
Raisins, unsulfured, dried, seedless	100	⅝ c.	268	2	1	71	.	24
	10	1 tbsp	26	Tr.	Tr.	7		2
Raspberries:								
Black, raw	100	¾ c.	74	2	2	16	6.8	81
Red								
Raw	100	¾ c.	57	1	Tr.	14	4.7	84
Frozen	100	3½ ozs.	98	1	Tr.	25	3 3	74
Rhubarb, stems only.								
Raw	100	¾ c. diced	16	1	Tr.	4	.7	95
Cooked, sugar added or canned in syrup*	100	⅜ c	141	Tr.	Tr.	36	.6	63
Rice.								
Brown, raw	100	½ c.	360	8	2	78	.6	12
Converted.								
Raw	100	½ c.	362	8	Tr	79	.2	12
Cooked, fluffy*	100	⅝ c.	116	2	Tr	25	.1	72
White or milled								
Raw	100	½ c	362	8	Tr.	79	.2	12
Cooked*	100	⅝ c	119	3	Tr.	26	.1	71
Rice products (added thiamine and niacin):								
Flakes	30	1 c.	118	2	Tr.	26	.2	1
Krispies	30	1 c.	107	2	Tr.	25	.1	Tr.
Puffed	14	1 c	55	1	Tr.	12	.1	Tr.
Rice, wild. *See* Wild rice.								

Tr *See* footnote on page 576
* Values are calculated from a recipe.

TABLE 1 (*Continued*)
MINERALS AND VITAMINS IN FOODS

List	Wt.	Minerals: Ca Mg.	P Mg	Fe Mg	Vitamins: Vitamin A I U	Thiamine Mg	Riboflavin Mg	Niacin Mg	Ascorbic Acid Mg.
Prune juice, canned	100	25	40	1.8		03	.08	.4	(1)
Prune whip	100	26	42	1.8	860	04	.11	.7	2
Pumpkin, canned	100	(20)	(36)	(7)	3,400	.02	06	.5	
Radishes, raw	20	7	6	.2	10	01	Tr.	.1	5
Raisins, unsulfured, dried	100	78	129	3 3	50	.15	.08	.5	Tr.
	10	8	13	.3	5	02	.01	Tr.	Tr.
Raspberries:									
Black, raw	100	40	37	9	0	02	.07	.3	24
Red									
Raw	100	40	37	.9	130	02	.07	3	24
Frozen	100	13	17	.6	330	.02	.06	.6	21
Rhubarb, stems only									
Raw	100	51†	25	.5	30	01		.1	9
Cooked, sugar added	100	41†	20	4	20	01		.1	6
Rice:									
Brown, raw	100	39	303	2 0	0	.32	05	4 6	0
Converted									
Raw	100	24	136	8	0	.20	.03	3 8	0
Cooked, fluffy	100	8	43	3	0	05	01	1.1	0
White or milled.									
Raw	100	24	136	.8	0	07	.03	1.6	0
Cooked	100	8	45	.3	0	01	.01	.4	0
Rice products (added thiamine and niacin)									
Flakes	30	6	35	.5	0	14	.03	1 6	0
Krispies	30	7	33	.5	0	.11	.01	2 0	0
Puffed	14	3	16	.3	0	06	.01	.8	0
Rice, wild *See* Wild rice.									

Tr. *See* footnote on page 576
Note Parentheses indicate imputed value
† Calcium may not be available because of the presence of oxalic acid.

TABLE 1 (*Continued*)
COMPOSITION OF FOODS EDIBLE PORTION

FOOD AND DESCRIPTION	Wt. Gm	Approximate Measure	Food Energy Cal.	Protein Gm	Fat Gm	CARBOHYDRATE Total Gm	Fiber Gm	Water Gm
Rolls.*								
Plain, enriched (pan rolls)	28	1 small	86	3	2	15	Tr.	7
Hamburger bun	38	1 large	118	3	2	21	Tr.	10
Sweet, enriched	100	2 rolls	323	9	8	54	.2	28
	55	1 roll	178	5	4	30	.1	15
Rutabagas, cooked	100	⅔ c diced	32	1	Tr.	8	1.4	91
Rye flour:								
Light	100	1¼ c. sifted	358	9	1	78	.4	11
Medium	100	1¼ c sifted	350	11	2	75	1.0	11
Dark	100	1⅓ c. sifted	330	16	3	68	2.4	11
Rye wafers or "Swedish health bread"	13	1⅞x3½ in. 2 wafers	43	2	Tr.	10	.3	1
Salad dressings								
Commercial, plain (mayonnaise type)	100	½ c scant	384	1	87	14	0	45
	15	1 tbsp.	58	Tr.	6	2	0	7
French	100	⅜ c.	394	1	36	20	.3	40
	15	1 tbsp	59	Tr	5	3	Tr	6
Home-cooked, boiled*	100	½ c scant	165	5	10	15	0	68
	17	1 tbsp	28	1	2	3	0	11
Mayonnaise	100	½ c	708	2	78	3	0	16
	13	1 tbsp.	92	Tr.	10	Tr.	0	2
Salmon. *See* Fish.								
Sardines. *See* Fish								
Sauerkraut, canned, drained solids	100	⅔ c.	22	1	Tr	4	.9	91
Sausage:								
Bologna	100	3½ ozs	221	15	16	4		62
Frankfurter, cooked	100	2 medium	248	14	20	2	.	62
Liver, liverwurst	100	3½ ozs	263	17	21	2		59
Pork, links or bulk, raw	100	3½ ozs.	450	11	45	0	0	42
Pork, bulk, canned	100	3½ ozs	299	15	26	0	0	55
Vienna sausage, canned	100	3½ ozs	215	16	16	0	0	64

Tr *See* footnote on page 576
* Values are calculated from a recipe

TABLE 1 (*Continued*)
MINERALS AND VITAMINS IN FOODS

LIST	Wt.	MINERALS Ca Mg	P Mg	Fe Mg	VITAMINS Vita-min A I U.	Thia-mine Mg	Ribo-flavin Mg.	Niacin Mg.	Ascorbic Acid Mg.
Rolls:									
Plain, enriched	28	15	27	.5†	0	07†	.04†	6†	0
Hamburger bun	38	21	36	7†	0	09†	06†	8†	0
Sweet, enriched	100	63	104	1 8†	0	.24†	15†	2 2†	0
	55	35	57	1.0†	0	.13†	.08†	1 2†	0
Rutabagas, cooked	100	55	41	4	350	05	.07	7	21
Rye flour:									
Light	100	22	185	1.1	0	15	07	6	0
Medium	100	(27)	262	2.6	0	.30	12	2 5	0
Dark	100	54	(536)	4.5	0	.61	.22	2.7	0
Rye wafers or "Swedish health bread"	13	6	52	6	0	04	03	.2	0
Salad dressings.									
Commercial, plain	100	9	30	.4	140	02	03	0	0
	15	1	4	.1	20	Tr	Tr	0	0
French	100	0	0	0	0	0	0	0	0
	15	0	0	0	0	0	0	0	0
Home-cooked	100	90	102	.7	500	06	.17	.3	Tr.
	17	15	17	1	80	01	.03	Tr.	Tr.
Mayonnaise	100	19	60	1.0	210	04	.04	0	0
	13	2	8	.1	30	Tr	Tr	0	0
Salmon. *See* Fish									
Sardines *See* Fish									
Sauerkraut, canned, drained solids	100	36	18	(5)	40	03	.06	.1	16
Sausage.									
Bologna	100	(9)	(112)	2 2	0	18	.19	2.7	0
Frankfurters, cooked	100	6	49	1 2	0	16	.18	2 5	0
Liver, liverwurst	100	9	238	5 4	5,750	.17	1.12	4.5	0
Pork, raw	100	6	100	1 6	0	43	17	2 3	0
Pork, bulk, canned	100	9	166	2 3	0	20	24	3 0	0
Vienna sausage	100	9	170	2.4	0	10	12	3 1	0

Tr *See* footnote on page 576

Note Parentheses indicate imputed value

† Iron, thiamine riboflavin and niacin are based on the minimum level of enrichment specified by the Federal Security Agency

TABLE 1 (*Continued*)
COMPOSITION OF FOODS EDIBLE PORTION

FOOD AND DESCRIPTION	Wt. Gm.	Approximate Measure	Food Energy Cal.	Protein Gm.	Fat Gm.	CARBOHYDRATE Total Gm	Fiber Gm	Water Gm.
Scallops, raw	100	3½ ozs.	78	15	Tr.	3	0	80
Sherbet*	100	½ c.	123	2	0	30		68
Shortbread*	100	12 pieces	504	7	24	64	.2	4
	16	2 squares, 1¾x1¾ in	81	1	4	10	Tr.	1
Shrimp, canned, dry pack or drained solids of wet pack	100	3½ ozs.	127	27	1			66
Syrup, table blends (chiefly corn syrup)	100	⅓ c.	286	0	0	74	.	25
	20	1 tbsp.	57	0	0	(15)		5
Soups, canned †								
Bean, ready to serve	250	1 c.	191	9	5	30	1 5	205
Beef, ready to serve	250	1 c	100	6	4	11	.2	229
Bouillon, ready to serve	240	1 c.	9	(2)		0	0	228
Chicken, ready to serve	250	1 c.	75	4	3	10	.2	235
Clam chowder, ready to serve	255	1 c.	86	5	2	13	.5	227
Cream soup (asparagus, celery or mushroom)	255	1 c.	201	7	12	18	.2	212
Liver soup, strained (infant food)	30	1 oz	16	1	Tr.	2	.1	26
Noodle, rice or barley, ready to serve	250	1 c.	117	6	5	13	1 3	226
Pea, ready to serve	245	1 c.	141	6	2	25	1 5	215
Tomato, ready to serve	245	1 c	90	2	2	18	.5	225
Vegetable								
Ready to serve	250	1 c	82	4	2	15	.8	229
Strained (infant food)	30	1 oz.	12	1	Tr.	3	.2	26
Vegetable and lamb soup, strained (infant food)	30	1 oz	14	1	Tr.	2	.2	27

Tr *See* footnote on page 576
Note Parentheses indicate imputed value
* Values are calculated from a recipe
† All ready-to-serve soups are calculated from equal weights of the condensed soup and water, except cream soup, which is based on equal weights of the condensed soups and milk

TABLE 1 (*Continued*)
MINERALS AND VITAMINS IN FOODS

		Minerals			Vitamins				
List	Wt	Ca Mg	P Mg	Fe Mg	Vitamin A I U	Thiamine Mg	Riboflavin Mg	Niacin Mg	Ascorbic Acid Mg.
Scallops, raw	100	26	208	1 8	0	(04)	.10	1 4	
Sherbet*	100	50	40	0	0	.02	08	Tr	
Shortbread*	100	10	59	4	0	04	.02	.5	0
	16	2	9	.1	0	01	Tr	.1	0
Shrimp, canned, dry pack or drained solids	100	115	263	3 1	60	01	03	2.2	0
Syrup, table blends	100	46	16	4.1	0	0	.01	.1	0
	20	9	3	.8	0	0	Tr.	Tr.	0
Soups, canned †									
Bean, ready to serve	250	95	102	2 8		.10	.10	.8	.
Beef, ready to serve	250	15	62	.5					
Bouillon, ready to serve	240	2	24	1 0	0	0	05	6	0
Chicken, ready to serve	250	20	20	5		02	.12	1.5	
Clam chowder, ready to serve	255	36	76	3 6					
Cream soup	255	217	176	.5	200	05	.20	.1	0
Liver soup, strained	30	5	18	.5	1,340	02	12	.5	1
Noodle, rice or barley	250	82	85	.2	30	02	.05	.7	0
Pea, ready to serve	245	32	98	1.5	(440)	17	.07	1.2	5
Tomato, ready to serve	245	24	39	1.0	(1,230)	.02	.10	.7	10
Vegetable									
Ready to serve	250	32	50	.8		.05	.08	1.0	8
Strained	30	7	11	.3	700	02	.02	.1	Tr.
Vegetable and lamb soup, strained	30	6	10	.2	740	01	01	3	Tr.

Tr *See footnote on page 676.*

Note Parentheses indicate imputed value

* Values are calculated from a recipe

† All ready-to-serve soups are calculated from equal weights of the condensed soup and water, except cream soup, which is based on equal weights of the condensed soups and milk.

TABLE 1 (*Continued*)
COMPOSITION OF FOODS EDIBLE PORTION

FOOD AND DESCRIPTION	Wt. Gm.	Approximate Measure	Food Energy Cal.	Protein Gm.	Fat Gm.	CARBOHYDRATE Total Gm.	CARBOHYDRATE Fiber Gm.	Water Gm.
Soybeans, whole, mature, dried	100	3½ ozs.	331	35	18	35†	5.0	8
Soybean flour, flakes, grits:								
Low fat	100	1 c.	238	45	1	38†	2.3	11
Medium fat	100	1 c.	264	43	7	37†	2.6	9
Soybean sprouts, raw	100	1 c.	46	6	1	5	.8	86
Spaghetti:								
Unenriched:								
Dry	100	1 c., 2-in. pieces	377	13	1	77	.4	9
Cooked*	100	⅔ c.	149	5	1	30	.2	61
Enriched:								
Dry	100	1 c., 2-in. pieces	377	13	1	77	.4	9
Cooked*	100	⅔ c	149	5	1	30	.2	61
Spinach:								
Raw	100	3½ ozs.	20	2	Tr.	3	.6	93
Cooked	100	½ c packed	26	3	1	4	1.0	91
Canned:								
Drained solids	100	½ c. packed	26	3	1	4	1.0	91
Strained (infant food)	30	1 oz.	4	1	Tr.	1	.2	28
Frozen, raw	100	3½ ozs	25	3	Tr	4	.8	91
Squash:								
Summer:								
Cooked, diced, fresh or frozen	100	½ c.	16	1	Tr.	4	.5	95
Winter:								
Baked, mashed	100	½ c.	47	2	Tr.	11	1.8	86
Boiled, mashed	100	½ c.	38	2	Tr.	9	1.4	89
Canned, strained (infant food)	30	1 oz.	8	Tr	Tr.	2	.2	27
Starch, pure (including arrowroot, corn, etc.)	100	¾ c	362	1	Tr.	87	.1	12
	8	1 tbsp.	29	0	0	7	Tr.	1

Tr. See footnote on page 576
* Values are calculated from a recipe
† Approximately 40 per cent of this total amount of carbohydrate calculated by difference is sugar, starch and dextrin. The remaining portion is made up of materials thought to be utilized only poorly, if at all, by the body.

TABLE 1 (*Continued*)
MINERALS AND VITAMINS IN FOODS

List	Wt	Minerals: Ca Mg	Minerals: P Mg	Minerals: Fe Mg	Vitamins: Vitamin A I U	Vitamins: Thiamine Mg	Vitamins: Riboflavin Mg	Vitamins: Niacin Mg	Vitamins: Ascorbic Acid Mg
Soybeans, whole, mature, dried	100	227	586	8.0	110	1.07	31	2.3	Tr.
Soybean flour, flakes, grits									
Low fat	100	265	623	13.0	70	1.10	35	2.9	0
Medium fat	100	244	610	13.0	110	82	34	2.6	0
Soybean sprouts	100	48	67	1.0	180	23	20	8	13
Spaghetti									
Unenriched									
Dry	100	22	165	1.5	0	.09	06	2.0	0
Cooked	100	9	65	6	0	02	02	.5	0
Enriched									
Dry	100	22	165	2.9†	0	88†	.37†	6.0†	0
Cooked	100	9	65	1.1	0	17	.10	1.4	0
Spinach.									
Raw	100	81‡	55	3.0	9,420	11	20	.6	59
Cooked	100	124‡	33	2.0	11,780	08	.20	6	30
Canned									
Drained solids	100	124‡	33	2.0	7,630	.02	.12	.4	14
Strained (infant food)	30	22‡	11	4	1,190	.01	03	.1	2
Frozen, raw	100	105‡	45	2.5	8,100	10	16	.5	35
Squash.									
Summer:									
Cooked, diced, fresh, frozen	100	15	15	4	260	04	07	.6	11
Winter									
Baked	100	24	35	.8	6,190	05	15	.6	7
Boiled	100	19	28	.6	4,950	.04	10	4	5
Canned, strained (infant food)	30	9	5	1	560	.01	02	(1)	1
Starch, pure (including arrowroot, corn, etc)	100 8	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0

Tr *See footnote on page 576*

[illegible] enrichment specified

TABLE 1 (*Continued*)

COMPOSITION OF FOODS EDIBLE PORTION

Food and Description	Wt Gm.	Approximate Measure	Food Energy Cal.	Protein Gm.	Fat Gm.	Carbohydrate Total Gm.	Carbohydrate Fiber Gm.	Water Gm.
Strawberries:								
Raw	100	⅔ c	37	1	1	8	1.4	90
Frozen, sugar added	100	3½ ozs.	106	1	Tr.	27	1.1	72
Sugars:								
Granulated, cane or beet	100	½ c.	385	0	0	100	0	1
	12	1 tbsp.	48	0	0	12	0	
Powdered	100	¾ c	385	0	0	100	0	1
Brown, dark	100	½ c.	370	0	0	96	0	3
Maple	100	3½ ozs.	348			(90)	0	8
Sweet potatoes:								
Baked	100	1 small	152	2	1	34	1.2	61
Boiled	100	½ medium	123	2	1	28	1.0	69
Candied	100	½ medium	179	2	4	36	.8	57
Canned, vacuum or solid pack	100	½ c.	107	2	Tr.	25	1.0	72
Tangerines (including other Mandarin type oranges)	100	1 medium	44	1	Tr.	11	1.0	87
Tangerine juice, unsweetened.								
Fresh or frozen reconstituted	100	½ c scant	39	1	Tr.	9	.	89
Canned	100	½ c scant	39	1	Tr	9	.	89
Tapioca, dry, granulated	100	⅝ c	360	1	Tr.	86	.1	13
Tomatoes.								
Raw	100	1 small	20	1	Tr.	4	.6	94
Canned or cooked	100	½ c	19	1	Tr.	4	.4	94
Tomato juice, canned	100	½ c scant	21	1	Tr.	4	.2	94
Tomato ketchup	17	1 tbsp.	17	Tr.	Tr.	4	.1	12
Tomato purée, canned	100	½ c scant	36	2	1	7	.4	89
Tongue beef, medium fat, raw	100	3½ ozs.	207	16	15	Tr.	0	68
Tortillas	100	5 tortillas	211	6	(3)	49	(1.4)	42
	20	1 tortilla	50	1	(1)	10	(.3)	8

Tr *See footnote on page 576*

Note Parentheses indicate imputed value

TABLE 1 (*Continued*)
MINERALS AND VITAMINS IN FOODS

		MINERALS			VITAMINS				
LIST	Wt.	Ca Mg	P Mg	Fe Mg	Vitamin A I U	Thiamine Mg	Riboflavin Mg	Niacin Mg.	Ascorbic Acid Mg.
Strawberries:									
Raw	100	28	27	.8	60	.03	.07	.3	60
Frozen, sugar added	100	14	17	.7	33	02	06	.5	53
Sugars.									
Granulated	100				0	0	0	0	0
	12				0	0	0	0	0
Powdered	100				0	0	0	0	0
Brown, dark	100	76	37	2 6	0	0	0	0	0
Maple	100								
Sweet potatoes:									
Baked	100	37	60	.9	9,510	10	06	8	23
Boiled	100	30	49	.7	7,700	09	05	.6	20
Candied	100	36	45	.9	6,250	.04	.04	.5	9
Canned, vacuum or solid pack	100	25	41	.8	8,850	.05	.04	.5	14
Tangerines (other Mandarin type oranges)	100	(33)	(23)	(4)	(420)	07	(03)	2	31
Tangerine juice:									
Fresh or frozen reconstituted	100	19	16	(.2)	(420)	07	(03)	(2)	31
Canned	100	19	16	.2	(420)	(06)	(03)	(.2)	(26)
Tapioca, dry	100	12	12	(1.0)	0	0	0	0	0
Tomatoes.									
Raw	100	11	27	.6	1,100	06	04	.5	23
Canned or cooked	100	(11)	(27)	(6)	1,050	.06	03	.7	16
Tomato juice, canned	100	(7)	(15)	(4)	1,050	.05	03	.8	16
Tomato ketchup	17	2	3	.1	(320)	02	01	.4	2
Tomato purée, canned	100	(11)	(37)	(1.1)	1,880	09	07	1 8	28
Tongue, beef	100	9	187	2 8	0	12	.29	5 0	0
Tortillas	100	111	184	2 2	210†	19	.06	1 0	·
	20	22	37	4	40†	04	01	.2	

Note Parentheses indicate imputed value

† Vitamin A value of tortillas made from yellow corn; tortillas made from white corn have no vitamin A value

TABLE 1 (*Continued*)
COMPOSITION OF FOODS EDIBLE PORTION

FOOD AND DESCRIPTION	Wt. Gm	Approximate Measure	Food Energy Cal	Protein Gm.	Fat Gm	CARBOHYDRATE Total Gm.	Fiber Gm.	Water Gm.
Tuna fish. *See* Fish.								
Turkey, medium fat, raw	100	3½ ozs.	268	20	20	0	0	58
Turnips:								
Raw	100	¾ c. diced	32	1	Tr.	7	1.1	91
Cooked	100	⅔ c. diced	27	1	Tr.	6	1.2	92
Turnip greens, boiled in small amount of water	100	½ c.	30	3	Tr.	5	1.2	90
Veal.								
Retail items, medium fat								
Cutlet, boned, *cooked*	100	*3½ ozs.*	219	28	*11*	*0*	*0*	60
Shoulder roast, boned, cooked	100	3½ ozs.	228	28	12	0	0	59
Stew meat without bone, cooked with liquid	100	3½ ozs.	296	25	21	0	0	53
Canned, strained (infant food)	30	1 oz	24	5	1	0	0	24
Vegetables, mixed, strained, canned (infant food)	30	1 oz	8	1	0	2	.2	27
Vinegar	100	½ c scant	12	0	.	(5)	0	
Waffles, baked with enriched flour*	75	*1 waffle, 4½x5½x½*	216	7	8	28	.1	30
Walnuts, Persian or English	100	1 c. of halves	654	15	64	16	2.1	3
	8	1 tbsp chopped	49	1	5	1	2	Tr
Watermelons	100	3½ ozs. per *portion*	28	1	Tr.	7	6	92

Tr. *See* footnote on page 576
Note Parentheses indicate imputed value
* Values are calculated from a recipe.

TABLE 1 (*Continued*)
MINERALS AND VITAMINS IN FOODS

List	Wt	Minerals: Ca Mg	Minerals: P Mg	Minerals: Fe Mg	Vitamins: Vitamin A I U.	Vitamins: Thiamine Mg	Vitamins: Riboflavin Mg.	Vitamins: Niacin Mg	Vitamins: Ascorbic Acid Mg.
Tuna fish. *See* Fish.									
Turkey	100	23	320	3 8	Tr.	09	.14	8.0	0
Turnips:									
Raw	100	40	34	.5	Tr.	05	.07	.5	28
Cooked	100	40	34	.5	Tr.	04	.06	.4	18
Turnip greens, boiled in small amount of water	100	259	50	2.4	10,600	.06	.41	.7	60
Veal:									
Retail items.									
Cutlet, boned, cooked	100	12	258	3 5	0	.08	.28	6 1	0
Shoulder roast, cooked	100	12	258	3 6	0	.13	.31	7.9	0
Stew meat, cooked	100	11	124	3 0	0	.10	.32	9.2	0
Canned (infant food)	30	4	48	5	0	01	09	1.6	0
Vegetables, mixed (infant food)	30	9	10	.3	270 *to* 1,510	.01	01	.1	1
Vinegar	100	7	10	.5				..	..
Waffles, baked, enriched flour	75	144	153	.8	270	05	.14	.3	0
Walnuts	100 8	83 6	380 28	2.1 2	30 Tr.	48 .04	.13 .01	1 2 .1	3 Tr.
Watermelons	100	7	12	.2	590	.05	.05	.2	6

Tr See footnote on page 576.

TABLE I (*Continued*)
COMPOSITION OF FOODS EDIBLE PORTION

Food and Description	Wt. Gm	Approximate Measure	Food Energy Cal.	Protein Gm.	Fat Gm.	Carbohydrate Total Gm.	Carbohydrate Fiber Gm.	Water Gm.
Wheat flours:								
Whole (from hard wheat)	100	1 c. scant	333	13	0	71	2.3	12
Self-rising, enriched	100	1 c. scant	350	9	1	74	.4	12
Patent.								
All purpose or family flour.								
Unenriched	100	1 c. scant	364	11	1	76	.3	12
Enriched	100	1 c. scant	364	11	1	76	.3	12
Bread flour								
Unenriched	100	1 c. scant	365	12	1	75	.3	12
Enriched	100	1 c. scant	365	12	1	75	.3	12
Cake or pastry flour	100	1 c. level	364	8	1	79	.2	12
Wheat products:								
Flakes (added iron, thiamine and niacin)	100	4 c.	355	11	2	80	1.7	4
	35	1 c.	125	4	1	28	.6	1
Germ	100	3½ ozs., 1 c.	361	25	10	50	2.5	11
Puffed (added iron, thiamine and niacin)	100	8 c.	355	11	2	80	1.7	4
	12	1 c.	43	1	Tr.	10	.2	1
Rolled, cooked*	100	⅜ c. scant	75	2	Tr.	17	.5	80
Shredded, plain	30	1 large biscuit, 4x2½ in.	102	3	1	23	.7	2
Whole meal, cooked*	100	½ c. scant	72	3	Tr.	16	.4	80
Whole meal (added wheat germ, iron and thiamine), cooked*	100	½ c. scant	55	2	Tr.	12	.3	85
White sauce, medium*	100	⅜ c scant	162	4	13	9	0	74
Wild rice, parched, raw	100	⅝ c	353	14	1	75	1.0	9
Yeast:								
Compressed, baker's	12	1 cake, 1 in. square	12	1	Tr.	3	Tr.	9
Dried, brewer's	8	1 tbsp.	22	(3)	Tr.	3	.1	1

Tr. *See* footnote on page 576.
Note Parentheses indicate imputed value.
* Values are calculated from a recipe

TABLE 1 (*Continued*)
MINERALS AND VITAMINS IN FOODS

List	Wt	Minerals: Ca Mg	Minerals: P Mg	Minerals: Fe Mg.	Vitamins: Vitamin A I U	Vitamins: Thiamine Mg	Vitamins: Riboflavin Mg.	Vitamins: Niacin Mg.	Vitamins: Ascorbic Acid Mg.
Wheat, flours,									
Whole	100	41	372	3 3	0	.55	.12	4 3	0
Self-rising, enriched	100	272†	484	2.9‡	0	.44‡	.26‡	3 5‡	0
Patent									
All purpose or family flour									
Unenriched	100	16	87	.8	0	.06	.05	9	0
Enriched	100	16	87	2 9‡	0	44‡	.26‡	3 5‡	0
Bread flour									
Unenriched	100	16	95	9	0	.08	.06	1.0	0
Enriched	100	16	95	2 9‡	0	44‡	.26‡	3 5‡	0
Cake or pastry	100	17	73	.5	0	.03	03	.7	0
Wheat products									
Flakes	100	46	329	4 2	0	56	.18	6 4	0
	35	16	115	1 5	0	.20	.06	2.2	0
Germ	100	84	1,096	8.1	0	2 05	.80	4 6	0
Puffed	100	46	329	4.2	0	.56	18	6 4	0
	12	6	39	5	0	07	.02	8	0
Rolled, cooked	100	8	76	7	0	07	.03	9	0
Shredded, plain	30	13	102	1 0	0	.06	.03	1 3	0
Whole meal, cooked	100	9	83	.7	0	10	.03	.9	0
Whole meal, enriched, cooked	100	8	65	4 9	0	22	03	.8	0
White sauce	100	115	95	.1	510	.03	15	.1	Tr.
Wild rice	100	19	339		0	.45	.63	6.2	0
Yeast:									
Compressed, baker's	112	3	86	7	0	06	.25	3 4	0
Dried, brewer's	8	8	151	1 5	0	.78	.44	2 9	0

Tr *See footnote on page 576*
† Calcium is based on the level usually found in self-rising flour
‡ *Iron, thiamine riboflavin and niacin* are based on the minimum level of enrichment specified under the Food, Drug and Cosmetic Act.

TABLE 2

FOOD COMPOSITION TABLE FOR SHORT METHOD OF DIETARY ANALYSIS[1]

FOOD*	APPROXIMATE MEASURE	WT Gm.	CALORIES	PROT. Gm	FAT Gm.	CARBOHYDRATE Gm	Ca Gm.	P Gm.	Fe Mg.	VIT. A I.U.	ASCORBIC ACID Mg	THIAMINE Mg	RIBOFLAVIN Mg.	NIACIN Mg.
eal products.														
efined	1 sl. bread (30 Gm), ½ c. cooked cereal and cereal products (20 Gm. dry); ¾-1 c. prep. cereal (20 Gm), 3 soda crackers (20 Gm), 1½ c popcorn (20 Gm); 1 griddle cake (4-in. diam).		80	2.5	1	15	.01	.02	.2			.02	02	.3
Whole grain and enriched	1 sl. bread (30 Gm), ½ c. cooked cereal (20 Gm. dry), ¾-1 c. prepared cereal (20 Gm.), 2 graham crackers (20 Gm).		80	2 5	1	15	02	.03	.6			07	.04	.6
iry products:														
Butter, Margarine	1 tsp	5	35		4					165				
Cheese, Cheddar type	1 cu. in	30	125	7 5	10	1	22	.15	.3	420		01	.13	
Cheese, cottage, skim	½ c.	100	95	19 5	1	2	.10	.19	3	20		02	.31	.1
Cream, light	⅛ c (for heavy cream add ½ serving butter)	30	60	1 0	6	1	03	02		250		.01	.04	
Custard	½ c.	130	150	7.0	7	15	.15	.16	.6	440		.06	.28	.1
Egg	1 medium	50	80	6 5	6		03	.10	1.4	570		05	.14	.1
Ice cream	½ c.	80	165	3 0	10	16	.10	.08	.1	420	1	03	.15	.1
Milk														
Buttermilk, skim	1 c.	240	85	8.5		12	.30	.23	.2		2	.10	.43	.2
Whole	1 c.	240	165	8 5	9	12	.28	.22	.2	385	2	.10	.41	.2

TABLE 2 (*Continued*)

FOOD COMPOSITION TABLE FOR SHORT METHOD OF DIETARY ANALYSIS[1]

Food*	Approximate Measure	Wt Gm	Calories	Prot Gm	Fat Gm.	Carbohydrate Gm	Ca Gm	P Gm.	Fe Mg	Vit A I.U	Ascorbic Acid Mg.	Thiamine Mg	Riboflavin Mg	Niacin Mg
Potato, cooked	1 small (100 Gm), for fried add 1 to 2 servings fat, for French fried (50 Gm) add 1 to 2 servings fat		85	2.0		19	01	06	.7	20	14‡	.09‡	.03	1.0
Tomato, fresh, canned, or juice	½ c, 1 small tomato (100 Gm), for 2½ tbsp catsup (50 Gm) add ½ serving sweets		20	1 0		4	01	.02	.5	1,035	18	.05	.03	.8
Other, cooked	½ c beets, eggplant, onions, etc	100	40	1 0		9	03	.05	6	80	8	03	.04	.3
Other, commonly served raw	2 pieces celery, 8 sl cucumber, ⅛ head lettuce	50	10	5		2	.02	02	.2	105	4	.02	.03	.2

[1] Leichsenring, J M., and Wilson, E D J Am. Dietet A. 27 386, 1951

* The nutritive value of food mixtures such as macaroni and cheese, Spanish rice, chow mein, creamed vegetables, soups and so on should be computed on the basis of the kind and the approximate amount of the foods in the combination

† For sauerkraut, reduce by one half

‡ For canned, reduce by one half

‖ Calcium may be unavailable in chard, spinach and beet greens

(*Explanation of Use of Table 2 on following page*)

TABLE 2 (*Continued*)

FOOD COMPOSITION TABLE FOR SHORT METHOD OF DIETARY ANALYSIS[1]

Food*	Approximate Measure	Wt. Gm	Calories	Prot. Gm	Fat Gm.	Carbohydrate Gm	Ca Gm.	P Gm.	Fe Mg	Vit A I U.	Ascorbic Acid Mg	Thiamine Mg	Riboflavin Mg.	Niacin Mg.
Fruits (*Continued*)														
Yellow—fresh, canned, dried	fresh (100 Gm); 1 medium peach, 2 to 3 apricots, 3 plums; dried (30 Gm); for sweetened, canned, dried or fresh add ⅓ serving sweets		70	.5		17	.01	03	.6	910	6	.01	.03	1.0
Other—dried	3 to 4 dates, 1½ to 2 small figs; dried apple, ¼ c. raisins	30	80	.5		20	.03	03	.9	15		04	.03	.3
Other—fresh and canned	½ c.	100	55	.5		13	.01	.01	.4	95	4	.04	.03	.2
Gravy, white sauce	¼ c.	65	105	2 5	8	6	.07	.06	.2	225		.04	.11	.2
Legumes														
Beans, peas	½ c. cooked, dried (30 Gm)		100	6.5		18	.05	.13	2.0	10	1	.19	.07	.7
Soybeans	½ c. cooked, dried (30 Gm)		105	10 5	5	4	07	.18	2.4	35		.32	.09	.7
Meat:														
Beef, lamb, veal, cooked	1 medium serving	75	240	19 0	18		.01	.15	2.3			.07	.17	3 7
Fowl, cooked	1 medium serving	75	150	15 0	10		.01	.16	1.7		.	.04	.08	5.2
Liver, cooked	1 small serving	60	125	14 0	5	6	.01	.29	4 7	32,100	19	.16	2.38	8 9
Luncheon meats, cooked	2 sl. sausage, minced ham, dried beef, luncheon roll (30 Gm), ½ frankfurter		85	6 0	7		.01	.05	.9			.08	08	.8
Pork, ham, cooked	1 medium serving	75	280	18 0	23	..	01	.16	2.2	.	.	.47	.17	3 5

Nuts:	1 tbsp peanut butter, 8 to 15 walnut halves, 16 peanuts, 12 to 15 almonds, 12 pecan halves	15	90	4 0	7	3	01	06	.3			04	.02	2.3
Sweets: Candy, sugar, syrup	1 tbsp. sugar, jelly, jam, syrup, honey, 1 serving plain Jello, plain candy (fondant or mints, 14 Gm), 6-oz bottle soft drink		55			14								
Candy bar	1 2-oz chocolate-coated bar		290	4 0	15	34	.06	09	1 1	65		.04	.17	1.1
Molasses, sorghum	1 tbsp	20	50			13	04	.01	1 8			.02	03	.6
Vegetables. Cabbage—cooked and sauerkraut	½ c.	100	25	1 5		5	.05	.03	.5	90	30‡	.05	.05	.3
Cabbage, raw, cauliflower, cooked	1 c. cabbage (50 Gm), ½ c cauliflower (70 Gm)		15	1.0	.	3	02	03	.5	50	22	04	04	.2
Corn, parsnips, cooked	½ c. corn, 1 large parsnip	100	85	2.0	1	19	03	07	.8	195	10‡	.07‡	.09‡	.6‡
Green and yellow Asparagus cooked	½ c	100	20	2 0		3	.02	.05	1 0	1,040	18‡	.13‡	.17‡	1.2‡
Broccoli, cooked	½ c	100	30	3 0		5	.13	08	1 3	3,400	74	.07	.15	.8
Carrots, cooked	½ c.	100	30	.5		7	03	.03	6	12,500	4‡	05‡	.05‡	.4‡
Green beans, cooked	½ c	100	25	1.5		5	04	.02	.7	660	14‡	.07‡	.10‡	.5‡
Leafy green, cooked	½ c spinach, turnip, kale, other greens	100	30	2 5		5	20§	.05	2 7	10,400	33‡	08‡	.21‡	.6‡
Peas, fresh, cooked, canned	½ c.	100	70	4 0		13	02	09	1 8	630	15‡	.25‡	.14‡	2 3‡
Sweet potato, cooked	½ large	100	140	2 0	1	31	03	.05	.8	8,605	22‡	.10‡	.06‡	.7‡

TABLE 2 (*Continued*)

FOOD COMPOSITION TABLE FOR SHORT METHOD OF DIETARY ANALYSIS[1]

FOOD*	APPROXIMATE MEASURE	WT GM.	CALORIES	PROT. GM	FAT GM.	CARBOHYDRATE GM.	CA GM	P GM.	FE MG.	VIT. A I.U.	ASCORBIC ACID MG.	THIAMINE MG.	RIBOFLAVIN MG.	NIACIN MG.
Potato, cooked	1 small (100 Gm.), for fried add 1 to 2 servings fat, for French fried (50 Gm) add 1 to 2 servings fat		85	2.0		19	.01	.06	.7	20	14‡	.09‡	03	1.0
Tomato, fresh, canned, or juice	½ c; 1 small tomato (100 Gm), for 2½ tbsp catsup (50 Gm) add ½ serving sweets		20	1 0		4	.01	.02	.5	1,035	18	.05	.03	.8
Other, cooked	½ c beets, eggplant, onions, etc.	100	40	1.0		9	.03	.05	.6	80	8	03	.04	.3
Other, commonly served raw	2 pieces celery, 8 sl. cucumber, ¼ head lettuce	50	10	.5		2	.02	.02	.2	105	4	.02	03	.2

[1] Leichsenring, J M, and Wilson, E. D: J Am Dietet. A *27*:386, 1951.

* The nutritive value of food mixtures such as macaroni and cheese, Spanish rice, chow mein, creamed vegetables, soups and so on should be computed on the basis of the kind and the approximate amount of the foods in the combination.

† For sauerkraut, reduce by one half.

‡ For canned, reduce by one half.

§ Calcium may be unavailable in chard, spinach and beet greens.

(*Explanation of Use of Table 2 on following page.*)

TABLE 2 (*Continued*)

FOOD COMPOSITION TABLE FOR SHORT METHOD OF DIETARY ANALYSIS

Explanation of Use of Table 2

To illustrate the use of the food composition table, a sample day's menu from one of the homemaker's record is given below

Breakfast	
Tomato juice	1 serving
Oatmeal	1 serving
Cream (light)	2 servings
Sugar	2 tsp
Bread, white enriched	1 sl
Butter	1 tsp.
Milk, whole	1 c.
Lunch	
Macaroni and cheese	1 serving
Head lettuce, French dressing	1 serving
Applesauce, sweetened	1 serving
Cupcake	1
Bread, whole wheat	1 sl
Butter	1 tsp.
Milk, whole	1 c.
Midafternoon	
Chocolate bar	1
Dinner	
Liver	1 small serving
Potato, baked	1 small
Butter	2 tsp
Green beans, buttered	1 serving
Celery	2 pieces
Bread, white enriched	1 sl
Butter	1 tsp
Chocolate pie	1 serving
Milk, whole	1 c

This day's menu may be summarized as follows in preparing to calculate the nutritive value from the figures in Table 2

FOODS	SERVINGS
Cereals.	
Refined	1
Whole grain or enriched	4
Dairy products:	
Butter	5½
Cheese, Cheddar	1
Cream, light	2
Milk, whole	3½
Desserts·	
Cake, plain	½
Pie crust	1
Pudding	1
Fruit: other, fresh or canned	1
Meat· liver	1
Sweets	1
Candy bar	1
Vegetables:	
Green beans	1
Potato	1
Tomato	1
Other, raw	1

Table 3
Classification of Fruits and Vegetables According to Carbohydrate Content

3% Carbohydrate

Vegetables (1% Protein)	Fruits
Asparagus	
Cabbage, Chinese	
Celery	
Chard	
Chicory leaves	
Cucumbers	
Endive, escarole	
Lettuce	
Mushrooms, canned	
Mustard greens	
Radishes	
Romaine lettuce	
Sauerkraut	
Spinach (3% prot.)	
Squash, summer (zucchini, yellow crooked neck)	
Tomatoes or juice	
Water cress	

6% Carbohydrate

Vegetables (2% Protein)	Fruits (1% Protein)
Beans, snap, green and wax	Avocado (26% fat)
Beet greens	Cantaloupe
Broccoli (3% prot.)	Watermelon
Cabbage	
Carrots, cooked	
Cauliflower	
Collards (4% prot.)	
Eggplant	
Kale (4% prot)	
Kohlrabi	
Okra	
Peppers, green and red	
Tomato purée, canned	
Turnips, turnip tops	

9% Carbohydrate

2% Protein	1% Protein
Artichokes, green	Gooseberries
Beets	Grapefruit or juice
Brussels sprouts (4% prot)	Lemons or juice
Carrots, raw	Lime juice
Dandelion greens	Melon, honeydew
Onions	Papayas
Pumpkin	Strawberries
Rutabagas	Tangerine juice
Squash, winter	

12% Carbohydrate

2% Protein	1% Protein
Egg noodles	Apricots
Peas, fresh or frozen (5% prot)	Blackberries
	Limes
	Oranges or juice
	Peaches
	Pineapple juice
	Plums
	Tangerines

15% Carbohydrate

2% Protein	1% Protein
Parsnips	Apples or juice
	Blueberries
	Cherries, sour and sweet
	Currants
	Loganberries
	Nectarines
	Pears
	Pineapple, fresh
	Raspberries, red and black

18% Carbohydrate

2% Protein	1% Protein
Lima beans, fresh canned (6% prot)	Grapes
Potatoes	Grape juice
	Guavas
	Mangoes
	Prune juice, canned

21% Carbohydrate

3% Protein	1% Protein
Corn	Bananas
Lima beans, frozen (6% prot)	Figs, fresh
	Persimmons
	Pineapple, frozen

25-35% Carbohydrate

	% Protein	% Carbohydrate
Prunes, dried, cooked without sugar	1	33
Plantains	1	31
Sweet potatoes		
Boiled	2	28
Baked	2	34
Macaroni, cooked	5	30
Spaghetti, cooked	5	30
Rice, cooked	2	26

Classification prepared by the Nutrition Department of The New York Hospital with values based upon U.S D A Handbook No 8, 1950

TABLE 4

CHOLESTEROL CONTENT OF FOODS*

	Mg. per 100 Gm		Mg per 100 Gm.
Meats·		Dairy products·	
Beef, round		Butter	280
Med. fat	125	Cheese	
Lean	95	Whole milk	135–160
Lamb, muscle, free of fat	70	Cottage	1.7
Pork, muscle, free of fat	60	Cream, 25% fat	87
Rabbit, muscle, free of fat	50	Eggs	
Veal	100–140	Whole	468
		Yolk	1,330
Organ meats:		White	0
Brain, beef	2,300	Milk	
Heart, beef	145	Whole, 4% fat	14
Kidney, beef	400	Skim, 1% fat	0 4
Liver:			
Beef	320	Miscellaneous·	
Calf	360	Fish liver oils	
Lamb	610	Cod	500
Pork	420	Halibut	7,500
Sweetbreads	280	Lard	110
Tripe	150	Beef suet, kidney	107
		Beef fat, other	90
Fish·		Mutton tallow, kidney	122
Codfish	50	Mutton fat, from chops	89
Oyster†	230–470	Pork fat, from chops	99
Salmon	60		
Shrimp†	150	No Cholesterol.	
Tuna, canned, oil removed	60	Cereals	
Fish roe and caviar	high in cholesterol	Coffee and tea	
		Fruits	
Fowl		Margarine made from vegetable oils	
Chicken·		Soup stock without fat	
Lean muscle	60–90	Vegetables	
Whole bird	113	Vegetable oils	
Breast with skin	89		
Duck, lean muscle	70		
Turkey, lean muscle	75		

* Table adapted from Okey, R Cholesterol content of foods, J Am Dietet A 21 341, 1945 Dobbin, E V., et al. Low Fat, Low Cholesterol Diet, Doubleday, 1951 Pihl, A. Scandinav J. Clin & Lab Invest. 4 116, 1952

† Oysters and shrimp are known to contain other sterols than cholesterol.

TABLE 5

SODIUM AND POTASSIUM CONTENT OF FOODS, SEASONINGS AND BEVERAGES

	Mg/100 Gm. Sodium	Mg/100 Gm. Potassium
Beverages		
Alcoholic:		
Beer	7*	46
Brandy	3	4
Rum	2	3
Whisky	1	1
Wine, average	7*	104
Nonalcoholic:		
Cocoa:		
Dry powder	5	1,400
Dutch process	57	3,200
Coffee		
Instant, dry	84	3,100
Roasted, dry	2	1,600
Soft drinks:		
Cola, gingerale and root beer	7*	1*
Orange crush	2	100
Postum, instant dry	71	2,200
Tea, blend dry	4	1,800
Breads and Cereals		
Barley, pearled	3	160
Breads		
Boston Brown with raisins	280	360
White, enriched	600*	180
Whole wheat	600*	230
Low sodium, avg of 14 commercial samples	28*	120
Corn flakes	660	160
Corn meal, yellow	1	120
Corn, popped without salt	3	240
Crackers		
Graham	710*	330
Rye, Ry-Krisp, matzoth, unsalted Passover bread	1	140
Farina		
Plain dry	2	86
Cream-of-Wheat, enriched	90	84
Flour		
Bleached, enriched	1	86
Bleached, phosphated	13	78
Buckwheat	1	680
Gluten	2	24
Rye, dark	1	860
Whole wheat (graham)	2	290
Macaroni or spaghetti, dry	5*	160
Oatmeal or rolled oats	2	340
Rice:		
Brown	9	150
Converted	4	170
White polished	2	130
Flakes	720	180
Puffed	1	100
Tapioca, dry	4	19
Wheat:		
Flakes	1,300*	320
Unsalted	2	.
Germ, plain	2	780
Gluten	2	24
Puffed cereal	4	340
Shredded	2	330
Dairy Products and Eggs		
Butter:		
Salted, avg	1,000*	23
Unsalted	10*	4
Buttermilk, cultured	130	140
Cream, 32% fat	40	56
Cheese:		
Cheddar	700*	92
Cottage	290*	72
Unsalted curd	20*	.
Cream, Philadelphia	250*	74
Process	1,500*	80
Swiss	710*	100
Eggs		
Whole	130	100
Whites only	150	100
Yolks only	85	100
Milk		
Cow's, fresh, whole	50	140
Fresh, skim	52	150
Condensed	140	340
Dry, skim	525	1,500
Dry, whole	410	1,100
Evaporated	100	270
Goat's, liquid	34	180
Low sodium, dry	14	1,000*
Malted, dry	440	720
Fats and Oils		
Vegetable shortening	0*	0
Margarine	1,100*	58
Unsalted	10*	
Oils		
Cod-liver, corn, olive	0	0
Cottonseed, peanut	Negligible	

* Value variable or subject to variation because of processing method.

TABLE 5 (*Continued*)

SODIUM AND POTASSIUM CONTENT OF FOODS, SEASONINGS AND BEVERAGES

	Mg/100 Gm	
	Sodium	Potassium
Fish and Shellfish		
Clams	180	240
Cod fish		
Unsalted, raw	65	360
Frozen fillet	400	400
Salted, dried	8,100	160
Crab, canned	1,000	110
Halibut		
Raw, unsalted	56	540
Lobster, boiled	210	180
Oysters, raw	73*	110
Salmon:		
Raw, unsalted	50	410
Canned with salt	540	300
Canned without salt	60*	
Sardines, canned	550*	560
Scallops, frozen	150	420
Shrimp, raw	140	220
Tuna fish:		
Canned	800*	240
Low salt dietetic	50*	
Fruits, fresh, canned, frozen, dried		
Apples:		
Juice, sweet cider	4	100
Raw, less skin and core	1	80
Sauce, canned	1	55
Sliced, frozen	66	68
Apricots		
Raw	1	440
Canned in syrup	4*	65
Dried	10*	1,700
Avocado	3	340
Banana	1	420
Blackberries, fresh or canned	1*	150
Blueberries, fresh or canned	1*	89
Cantaloupe	13	230
Cherries		
Sour, canned or frozen	2*	78
Sweet, raw or frozen	1	260
Canned in syrup	1	77
Cranberries		
Raw	1	65
Sauce, canned	1*	17
Currants		
Raw, red	2	160
Dried	20	730
Dates, semidry	1	790

	Mg/100 Gm	
	Sodium	Potassium
Figs		
Fresh	2	190
Canned in syrup	2*	105
Dried	34	780
Fruit cocktail, canned	5*	160
Gooseberries, raw	1	87
Grapefruit		
Fresh	1	200
Juice, sweetened, canned	2*	150
Sections, frozen	5	60
Grapes		
Concord, less skins/seeds	3	84
Juice, Concord	1	120
Thompson seedless	4	160
Lemon, pulp and juice	1	130
Lime, pulp and juice	1	100
Nectarine, less skin	2	320
Olives		
Green, pickled or stuffed	2,000*	55
Ripe, pickled	980	23
Orange		
Fresh pulp and juice	1	170
Juice, canned	1	160
Peaches		
Fresh, less skin	1	160
Canned in syrup	2*	31
Frozen in syrup	3	120
Pears		
Fresh, less skin	2	100
Canned in syrup	2*	52
Pineapple		
Raw	1	210
Canned in syrup	1*	120
Frozen in syrup	1	38
Juice, canned	1	140
Plums		
Fresh, raw	1	170
Canned in syrup	1*	110
Prunes		
Raw with skin	1	210
Canned in syrup	3*	220
Dried	6	600
Juice, bottled	2	260
Raisins, seedless	25	720
Raspberries, red, raw	1	130
Rhubarb		
Raw	2	70
Frozen in syrup	2	180
Strawberries		
Raw	1	180
Frozen, sweetened	2	180
Tangerine, pulp and juice	1	110
Watermelon	1	110

* Value variable or subject to variation because of processing method

TABLE 5

SODIUM AND POTASSIUM CONTENT OF FOODS, SEASONINGS AND BEVERAGES

	Mg/100 Gm. Sodium	Mg/100 Gm. Potassium
Beverages		
Alcoholic		
Beer	7*	46
Brandy	3	4
Rum	2	3
Whisky	1	1
Wine, average	7*	104
Nonalcoholic		
Cocoa.		
Dry powder	5	1,400
Dutch process	57	3,200
Coffee		
Instant, dry	84	3,100
Roasted, dry	2	1,600
Soft drinks		
Cola, gingerale and root beer	7*	1*
Orange crush	2	100
Postum, instant dry	71	2,200
Tea, blend dry	4	1,800
Breads and Cereals		
Barley, pearled	3	160
Breads		
Boston Brown with raisins	280	360
White, enriched	600*	180
Whole wheat	600*	230
Low sodium, avg of 14 commercial samples	28*	120
Corn flakes	660	160
Corn meal, yellow	1	120
Corn, popped without salt	3	240
Crackers		
Graham	710*	330
Rye, Ry-Krisp, matzoth, unsalted Passover bread	1	140
Farina		
Plain dry	2	86
Cream-of-Wheat, enriched	90	84
Flour		
Bleached, enriched	1	86
Bleached, phosphated	13	78
Buckwheat	1	680
Gluten	2	24
Rye, dark	1	860
Whole wheat (graham)	2	290
Macaroni or spaghetti, dry	5*	160

	Mg/100 Gm Sodium	Mg/100 Gm Potassium
Oatmeal or rolled oats	2	340
Rice.		
Brown	9	150
Converted	4	170
White polished	2	130
Flakes	720	180
Puffed	1	100
Tapioca, dry	4	19
Wheat.		
Flakes	1,300*	320
Unsalted	2	..
Germ, plain	2	780
Gluten	2	24
Puffed cereal	4	340
Shredded	2	330
Dairy Products and Eggs		
Butter.		
Salted, avg.	1,000*	23
Unsalted	10*	4
Buttermilk, cultured	130	140
Cream, 32% fat	40	56
Cheese		
Cheddar	700*	92
Cottage	290*	72
Unsalted curd	20*	
Cream, Philadelphia	250*	74
Process	1,500*	80
Swiss	710*	100
Eggs		
Whole	130	100
Whites only	150	100
Yolks only	85	100
Milk		
Cow's, fresh, whole	50	140
Fresh, skim	52	150
Condensed	140	340
Dry, skim	525	1,500
Dry, whole	410	1,100
Evaporated	100	270
Goat's, liquid	34	180
Low sodium, dry	14	1,000*
Malted, dry	440	720
Fats and Oils		
Vegetable shortening	0*	0
Margarine	1,100*	58
Unsalted	10*	
Oils		
Cod-liver, corn, olive	0	0
Cottonseed, peanut	Negligible	

* Value variable or subject to variation because of processing method.

TABLE 5 (*Continued*)

SODIUM AND POTASSIUM CONTENT OF FOODS, SEASONINGS AND BEVERAGES

	Mg/100 Gm Sodium	Mg/100 Gm Potassium
Fish and Shellfish		
Clams	180	240
Cod fish:		
Unsalted, raw	65	360
Frozen fillet	400	400
Salted, dried	8,100	160
Crab, canned	1,000	110
Halibut		
Raw, unsalted	56	540
Lobster, boiled	210	180
Oysters, raw	73*	110
Salmon		
Raw, unsalted	50	410
Canned with salt	540	300
Canned without salt	60*	
Sardines, canned	550*	560
Scallops, frozen	150	420
Shrimp, raw	140	220
Tuna fish		
Canned	800*	240
Low salt dietetic	50*	
Fruits, fresh, canned, frozen, dried		
Apples		
Juice, sweet cider	4	100
Raw, less skin and core	1	80
Sauce, canned	1	55
Sliced, frozen	66	68
Apricots		
Raw	1	440
Canned in syrup	4*	65
Dried	10*	1,700
Avocado	3	340
Banana	1	420
Blackberries, fresh or canned	1*	150
Blueberries, fresh or canned	1*	89
Cantaloupe	13	230
Cherries		
Sour, canned or frozen	2*	78
Sweet, raw or frozen	1	260
Canned in syrup	1	77
Cranberries		
Raw	1	65
Sauce, canned	1*	17
Currants		
Raw, red	2	160
Dried	20	730
Dates, semidry	1	790

	Mg/100 Gm Sodium	Mg/100 Gm Potassium
Figs		
Fresh	2	190
Canned in syrup	2*	105
Dried	34	780
Fruit cocktail, canned	5*	160
Gooseberries, raw	1	87
Grapefruit:		
Fresh	1	200
Juice, sweetened, canned	2*	150
Sections, frozen	5	60
Grapes:		
Concord, less skins/seeds	3	84
Juice, Concord	1	120
Thompson seedless	4	180
Lemon, pulp and juice	1	130
Lime, pulp and juice	1	100
Nectarine, less skin	2	320
Olives		
Green, pickled or stuffed	2,000*	55
Ripe, pickled	980	23
Orange		
Fresh pulp and juice	1	170
Juice, canned	1	160
Peaches		
Fresh, less skin	1	160
Canned in syrup	2*	31
Frozen in syrup	3	120
Pears		
Fresh, less skin	2	100
Canned in syrup	2*	52
Pineapple		
Raw	1	210
Canned in syrup	1*	120
Frozen in syrup	1	88
Juice, canned	1	140
Plums		
Fresh, raw	1	170
Canned in syrup	1*	110
Prunes		
Raw with skin	1	210
Canned in syrup	3*	220
Dried	6	600
Juice, bottled	2	260
Raisins, seedless	25	720
Raspberries, red, raw	1	130
Rhubarb		
Raw	2	70
Frozen in syrup	2	180
Strawberries		
Raw	1	180
Frozen, sweetened	2	180
Tangerine, pulp and juice	1	110
Watermelon	1	110

* Value variable or subject to variation because of processing method

TABLE 5 (*Continued*)

SODIUM AND POTASSIUM CONTENT OF FOODS, SEASONINGS AND BEVERAGES

	MG./100 GM. Sodium	MG./100 GM. Potassium
Meats and Poultry		
Bacon, fried crisp	2,400*	390
Beef:		
Lean, raw	70	360
Corned	1,300	60
Heart	85	160
Kidney	200*	310
Chicken, avg light and dark	75*	285
Duck, avg light and dark	85*	285
Ham, raw	1,100*	340
Lamb, lean, raw	90	360
Liver:		
Beef	130*	380
Pork	80	350
Pork		
Lean, raw	55	260
Salt	1,800	27
Rabbit	40	385
Veal, lean, raw	*100**	*330*
Nuts		
Almonds:		
Raw	3	690
Roasted and salted	160*	710
Brazil nuts:		
Raw	1	670
Roasted and salted	190*	730
Cashew nuts		
Raw	14	560
Roasted and salted	200*	560
Coconut, dry, shredded	20	770
Filberts (hazelnuts)	1	560
Peanuts:		
Raw or roasted	2	740
Salted with skin	460*	700
Peanut butter:	120	820
Without salt	5*	
Walnuts, English or black	2	450
Sweets		
Candy:		
Marshmallow	*41*	*6*
Milk chocolate	86	420
Peppermint patty	10	110
Sweet chocolate	*35*	*230*
Honey	7	10*
Syrups:		
Corn (Karo)	68	4
Maple	14	130
Sorghum	20*	600
Table blends	60*	4
Sugar:		
Light brown	25	230
White	Negligible	

	MG./100 GM. Sodium	MG./100 GM. Potassium
Vegetables, fresh, frozen, dried		
Asparagus:		
Avg fresh or frozen	3	280
Canned spears	410	130
Canned without salt	4	
Beans:		
Baked with tomato sauce	400	140
Lima:		
Fresh	1	680
Frozen	310*	580
Canned without salt	2	..
Snap:		
Green or wax	1	300
Canned	410	120
Canned without salt	2	.
Frozen	2	110
Beets:		
Fresh, raw	60*	350
Canned without salt	*40**	*120*
Beet greens, fresh	130	570
Broccoli:		
Fresh	15	400
Frozen	15	250
Brussels sprouts:		
Fresh	12	450
Frozen	12	300
Cabbage, raw	15	230
Carrots		
Raw	50	410
Canned without salt	35*	.
Cauliflower, fresh or frozen	20	*400*
Celery, stalks	100	300
Corn		
Sweet, fresh	1	.
White or yellow, canned	200	200
Canned without salt	2	
Cucumber, raw	5*	230
Eggplant, less skin	2	190
Kale, fresh	80*	410
Lettuce, head	*15**	*140*
Mushrooms, fresh	5	520
Mustard greens	48	450
Okra, fresh pods	*1*	*220*
Onions	10*	130
Parsley, fresh	30	880
Parsnips, raw	8	740
Peas		
Raw	2	370
Frozen	variable	160
Canned without salt	2*	
Dry, split	20*	880
Peppers, green pods	1	170

* Value variable or subject to variation because of processing method.

TABLE 5 (*Continued*)

SODIUM AND POTASSIUM CONTENT OF FOODS, SEASONINGS AND BEVERAGES

	MG/100 GM. Sodium	MG/100 GM. Potassium
Vegetables (*Continued*)		
Potatoes, raw		
Sweet, less skin	10*	530
White, less skin	3	410
Pumpkin, raw	1	480
Radish, raw	15*	260
Rutabaga, raw	2	260
Spinach.		
Fresh	75*	780
Frozen	70*	380
Canned without salt	50*	
Squash		
Summer	1	175
Winter	1	250
Tomatoes		
Fresh	3	230
Canned, regular	variable	130
Canned, without salt	3*	
Tomato juice.		
Canned	230*	230
Without salt	5*	
Turnips, white	40*	230
Turnip greens	10	440
Miscellaneous		
Catsup, tomato	1,300	800
Gelatin		
Plain	30*	22
Dessert, flavored	330	210
Dessert, without salt	10	
Jams and jellies	12*	
Marmalade, orange	13	19
Mayonnaise	590	25
Without salt	25*	
Pickles, dill	1,400	200

	MG/100 GM. Sodium	MG/100 GM. Potassium
Potato chips	340	800
Yeast		
Bakers	3	670
Cultured, dry, avg.	115	1,860
Spices and Seasonings		
Allspice	62	680
Caraway seed	17	1,400
Celery salt	28,000	380
Celery seed	140	1,400
Chocolate, unsweetened	4	830
Cinnamon, ground	8	200
Citron, candied	290	120
Clove, whole	210	1,000
Curry powder	45	1,300
Dill seed	13	1,000
Garlic, clove	6	510
Ginger, ground	34	910
Mace	45	180
Mustard		
Powder	10	
Prepared paste	1,300	130
Nutmeg	24	
Onion powder	93	
Paprika	82	2,300
Parsley flakes, dry	490	
Pepper		
Black	16	880
Red	46	2,400
White	5	48
Poppyseed	11	
Sage, dry	20	670
Thyme, dry	38	500
Turmeric	22	2,700
Vanilla, extract	1	74
Vinegar, cider	1	100
Worcestershire sauce	2,100	480

* Value variable or subject to variation because of processing method.

Figures derived from Bills C E., et al. J Am. Dietet A. 25 304, 1949 Davidson, C. S., et al. National Research Council Pub 325, 1954

TABLE 6

ACID-BASE REACTION OF FOODS

POTENTIALLY ACID OR ACID ASH FOODS	POTENTIALLY BASIC OR ALKALINE ASH FOODS
Breads, all types	Fruits, all types (except cranberries, plums and prunes*)
Cakes and cookies, plain	James and jellies, honey
Cereals and crackers	Milk, cream and buttermilk†
Cheese, all types	Molasses
Eggs	Nuts almonds, coconut, chestnuts
Fish and shellfish	Vegetables, all types (except corn and lentils)
[illegible]	
[illegible]	
[illegible]	
[illegible] ts	

NEUTRAL FOODS

Butter or margarine	Syrups
Candy, plain	Starches, corn and arrowroot
Cooking fats and oils	Sugars

* Ash alkaline in vitro, partly acid in vivo, because organic acids are not completely utilized.

† Calcium largely excreted into intestinal tract. Therefore, effect upon pH of serum and urine tends to be acid because of high phosphate content.

TABLE 7

BLOOD AND URINE COMPONENTS

	Blood	Deviations in Disease	
	Normal Range	Decreased	Increased
Hematology			
Red blood cells (erythrocytes)	4 5–5 million per cu mm	Anemia Hemorrhage Chronic infectious diseases Prolonged dietary deficiency of iron	Polycythemia Dehydration
White blood cells (leukocytes)	5–10 thousand per cu mm.	Leukopenia	Acute infections Leukemias
Hemoglobin	13–16 Gm /100 cc	Anemias	Polycythemia Dehydration
Hematocrit	$\frac{\text{Red cells}}{\text{Serum}}$ = 42–50% cells	Anemia	Polycythemia
Chemistry			
Sugar	70–100 mg /100 cc	Hyperinsulinism Addison's disease	Diabetes mellitus Cushing's syndrome
Nonprotein nitrogen	*15–35 mg./100 cc*		Dehydration Renal disease
Uric Acid	3–5 mg /100 cc		Gout Nephrosis
Urea nitrogen	10–20 mg /100 cc		Renal disease
Creatinine	1–1 5 mg /100 cc		Renal disease
Protein, total	6–8 Gm /100 cc	Nephrosis	Multiple myeloma (Bence-Jones protein)
Albumin	4 0–5 2 Gm /100 cc.	Nephritis with edema	
Globulin	1 3–2 7 Gm /100 cc.	Liver disease	
Calcium	9–11 mg /100 cc.	Renal disease Hypoparathyroidism Chronic rickets Steatorrhea	Hyperparathyroidism Multiple myeloma
Potassium	4 0–5 0 mEq /liter	Periodic paralysis	Addison's disease Renal disease
Sodium	139–144 mEq /liter	Diabetic acidosis Addison's disease Diarrhea Dehydration	Dehydration
Phosphorus	3 0–4 5 mg /100 cc.	Rickets Renal disease Hyperparathyroidism	Hypoparathyroidism Renal disease Diabetic coma

TABLE 7 (*Continued*)

Blood	Normal Range	Deviations in Disease: Decreased	Deviations in Disease: Increased
Chemistry (*Continued*)			
Chlorides	99–104 mEq /liter	Renal disease Addison's disease Vomiting	Dehydration Renal disease
Cholesterol	*150–280 mg /100 cc.*	*Pernicious anemia* Malnutrition Hyperthyroidism	*Atherosclerosis* Biliary obstruction Myxedema Uncontrolled diabetes Renal disease
Bilirubin, total	0.1–0 8 mg /100 cc.		Jaundice
Phosphatase (alkaline)	1–4 units/100 cc (Bodansky)		Certain bone diseases
Vitamin C (in serum)	0 5–1 4 mg /100 cc.	Infection Dietary deficiency Leukemia	
Vitamin A	40–100 I.U /100 cc.	Cirrhosis Infectious hepatitis Myxedema Malnutrition	
Carbon dioxide combining power	21–28 mEq /liter	Metabolic acidosis Hypoventilation	Metabolic alkalosis Hyperventilation

COMPOSITION OF URINE

	Normal Range/24 Hrs		Normal Range/24 Hrs
Volume	1,000–1,500 cc	Mineral salts:	
Specific gravity 1 008–1.030		Calcium	100–300 mg
pH 5 5–8		Chlorides (as NaCl)	10–15 Gm
Total solids	55–70 Gm.	Magnesium	150–300 mg
Nitrogenous constituents:		Oxalate	15–30 mg.
Total nitrogen	10–17 Gm.	Phosphate	1–1.2 Gm
Urea	20–35 Gm	Potassium	2–3 Gm
Uric acid	0 5–0.7 Gm.	Sodium	4–5 Gm.
Creatinine	1 0–1 5 Gm.	Sulfates (total)	1–2 Gm.
Ammonia	0 5–1.0 Gm.		
Amino acids	0 5–1 5 Gm.		

TABLE 8
EQUIVALENT WEIGHTS AND MEASURES

WEIGHT EQUIVALENTS

	Milligram	Gram	Kilo-gram	Grain	Ounce	Pound
1 microgram (mcg.)	001	000001				
1 milligram (mg)	1	001		0154		
1 gram (Gm)	1,000.	1	001	15 4	035	0022
1 kilogram (Kg)	1,000,000	1,000	1	15,400	35.2	2 2
1 grain (gr.)	64 8	065		1.		
1 ounce (oz)		28 3		437 5	1	.063
1 pound (lb)		453 6	.454		16 0	1.

VOLUME EQUIVALENTS

	Cubic Millimeter	Cubic Centimeter	Liter	Fluid Ounce	Pint	Quart
1 cubic millimeter (cu mm)	1	001				
1 cubic centimeter (cc.)	1,000	1	001			
1 liter (L.)	1,000,000	1,000	1	33 8	2 1	1 05
1 fluid ounce		30.(29 57)	03	1		
1 pint (pt)		473	473	16	1.	
1 quart (qt)		946	946	32.	2	1.

LINEAR EQUIVALENTS

	Millimeter	Centimeter	Meter	Inch	Foot	Yard
1 millimeter (mm)	1	.1	001	039	.00325	0011
1 centimeter (cm.)	10	1.		39	0325	011
1 meter (M)	1,000	100	1	39 37	3 25	1 08
1 inch (in)	25 4	2 54	025	1	083	.028
1 foot (ft)	304 8	30 48	305	12	1	.33
1 yard (yd.)	914.4	91.44	914	36	3	1.

TABLE 8 (*Continued*)
EQUIVALENT WEIGHTS AND MEASURES

COMPARATIVE VALUES OF WEIGHT AND VOLUME OF WATER

1 liter	=	1 kilo.	=	2.2 lbs
1 fluid ounce	=	30 Gm.	=	1 04 ozs.
1 pint	=	473 Gm	=	1 04 lbs.
1 quart	=	946 kilo.	=	2 1 lbs.

TABLE OF COMMON MEASURES AND METRIC EQUIVALENTS

1 tsp.	=	5 cc	
1 tbsp	=	14 cc.	(approx. 15 Gm.)
1 cup	=	225 cc	(approx. 240 Gm)

(*See* Table of Measures and Approximate Weights, p. 407)

COMPARATIVE TEMPERATURES

Boiling water, sea level	100	212
Body temperature	37	98 6
Tropical temperature	30	89
Room temperature, average	20	70
Freezing	0	32

TABLE OF MEASURES AND APPROXIMATE WEIGHTS

3 teaspoons	1 tbsp.
16 tablespoons	1 cup
½ cup	1 gill
2 cups	1 pt.
4 cups	1 qt.
2 pints	1 qt
4 quarts	1 gal.
1 tablespoon butter	½ oz.
*1 tablespoon liquid	½ oz
1 tablespoon flour	¼ oz
1 tablespoon sugar	½ oz
*1 cup liquid	8 ozs
1 cup flour	4½ ozs.
1 cup butter	8 ozs.
1 cup sugar	10 ozs

* Water or milk

Table 9

Average Weight for Height Tables*

For Girls from Birth to School Age†

Height (In.)	1 Mo	3 Mos	6 Mos	9 Mos.	12 Mos	18 Mos	24 Mos.	30 Mos.	36 Mos.	48 Mos	60 Mos	72 Mos.
20	8											
21	9	10										
22	10	11										
23	11	12	13									
24	12	13	14	14								
25	13	14	15	15								
26		15	16	17	17							
27		16	17	18	18							
28			19	19	19	19						
29			19	20	20	20						
30			21	21	21	21	21					
31				22	22	23	23	23				
32					23	24	24	24	25			
33						25	25	25	26			
34						26	26	26	27			
35						29	29	29	29	29		
36							30	30	30	30	31	
37							31	31	31	31	32	
38								33	33	33	33	
39								34	34	34	34	34
40									35	36	36	36
41										37	37	37
42										39	39	39
43										40	41	41
44											42	42
45												45
46												47
47												50
48												52

* Metropolitan Life Insurance Company

† Prepared by Robert M. Woodbury, Ph.D., Children's Bureau, U. S. Dept. of Labor

TABLE 9 (*Continued*)

AVERAGE WEIGHT FOR HEIGHT TABLES*

For Boys from Birth to School Age†

Height (In.)	1 Mo.	3 Mos.	6 Mos.	9 Mos.	12 Mos.	18 Mos.	24 Mos.	30 Mos	36 Mos	48 Mos	60 Mos	72 Mos
20	8											
21	9	10										
22	10	11										
23	11	12	13									
24	12	13	14									
25	13	14	15	16								
26		15	17	17	18							
27		16	18	18	19							
28			19	19	20	20						
29			20	21	21	21						
30			22	22	22	22	22					
31				23	23	23	23	24				
32				24	24	24	25	25				
33					26	26	26	26	26			
34						27	27	27	27			
35						29	29	29	29	29		
36							30	31	31	31		
37							32	32	32	32	32	
38								33	33	33	34	
39								35	35	35	35	
40									36	36	36	36
41										38	38	38
42										39	39	39
43										41	41	41
44											43	43
45											45	45
46												48
47												50
48												52
49												55

* Metropolitan Life Insurance Company

† Prepared by Robert M. Woodbury, Ph D., Children's Bureau, U. S. Dept. of Labor.

TABLE 9 (*Continued*)

AVERAGE WEIGHT FOR HEIGHT TABLES*

For Girls from 5 to 18 Years‡

Height (In)	5 Yrs.	6 Yrs	7 Yrs	8 Yrs	9 Yrs	10 Yrs	11 Yrs	12 Yrs	13 Yrs	14 Yrs	15 Yrs	16 Yrs	17 Yrs	18 Yrs
38	33	33												
39	34	34												
40	36	36	36											
41	37	37	37											
42	39	39	39											
43	41	41	41	41										
44	42	42	42	42										
45	45	45	45	45	45									
46	47	47	47	48	48									
47	49	50	50	50	50	50								
48		52	52	52	52	53	53							
49		54	54	55	55	56	56							
50		56	56	57	58	59	61	62						
51			59	60	61	61	63	65						
52			63	64	64	64	65	67						
53			66	67	67	68	68	69	71					
54				69	70	70	71	71	73					
55				72	74	74	74	75	77	78				
56					76	78	78	79	81	83				
57					80	82	82	82	84	88	92			
58						84	86	86	88	93	96	101		
59						87	90	90	92	96	100	103	104	
60						91	95	95	97	101	105	108	109	111
61							99	100	101	105	108	112	113	116
62							104	105	106	109	113	115	117	118
63								110	110	112	116	117	119	120
64								114	115	117	119	120	122	123
65								118	120	121	122	123	125	126
66									124	124	125	128	129	130
67									128	130	131	133	133	135
68									131	133	135	136	138	138
69										135	137	138	140	142
70										136	138	140	142	144
71										138	140	142	144	145

* Metropolitan Life Insurance Company.

‡ Prepared by Bird T Baldwin, Ph D, and Thomas D Wood, M.D

TABLE 9 (*Continued*)

AVERAGE WEIGHT FOR HEIGHT TABLES*

For Boys from 5 to 19 Years‡

Height (In)	5 Yrs	6 Yrs	7 Yrs	8 Yrs.	9 Yrs.	10 Yrs.	11 Yrs.	12 Yrs.	13 Yrs	14 Yrs.	15 Yrs.	16 Yrs.	17 Yrs.	18 Yrs	19 Yrs
38	34	34													
39	35	35													
40	36	36													
41	38	38	38												
42	39	39	39	39											
43	41	41	41	41											
44	44	44	44	44											
45	46	46	46	46	46										
46	47	48	48	48	48										
47	49	50	50	50	50	50									
48		52	53	53	53	53									
49		55	55	55	55	55	55								
50		57	58	58	58	58	58	58							
51			61	61	61	61	61	61							
52			63	64	64	64	64	64	64						
53			66	67	67	67	67	68	68						
54				70	70	70	70	71	71	72					
55				72	72	73	73	74	74	74					
56				75	76	77	77	77	78	78	80				
57					79	80	81	81	82	83	83				
58					83	84	84	85	85	86	87				
59						87	88	89	89	90	90	90			
60						91	92	92	93	94	95	96			
61							95	96	97	99	100	103	106		
62							100	101	102	103	104	107	111	116	
63							105	106	107	108	110	113	118	123	127
64								109	111	113	115	117	121	126	130
65								114	117	118	120	122	127	131	134
66									119	122	125	128	132	136	139
67									124	128	130	134	136	139	142
68										134	134	137	141	143	147
69										137	139	143	146	149	152
70										143	144	145	148	151	155
71										148	150	151	152	154	159
72											153	155	156	158	163
73											157	160	162	164	167
74											160	164	168	170	171

* Metropolitan Life Insurance Company.

‡ Prepared by Bird T. Baldwin, Ph D, and Thomas D Wood, M D

TABLE 10

HEIGHT-WEIGHT TABLES FOR MEN AND WOMEN

Comparative Significance of Ideal vs. Average Weights for Adults

Tables of average weight for height for men and women at different ages, compiled by insurance companies from their records, were formerly used as the only guides to desirable weight Evaluation of their statistics in terms of health and longevity disclosed that it was more advantageous to be slightly overweight under 30 and underweight over 30 as compared with average for age

IDEAL WEIGHTS FOR WOMEN AGED 25 AND OVER*

HEIGHT (WITH SHOES)		WEIGHT IN POUNDS (AS ORDINARILY DRESSED)		
Ft	In.	Small Frame	Medium Frame	Large Frame
4	11	104–111	110–118	117–127
5	0	105–113	112–120	119–129
5	1	107–115	114–122	121–131
5	2	110–118	117–125	124–135
5	3	113–121	120–128	127–138
5	4	116–125	124–132	131–142
5	5	119–128	127–135	133–145
5	6	123–132	130–140	138–150
5	7	126–136	134–144	142–154
5	8	129–139	137–147	145–158
5	9	133–143	141–151	149–162
5	10	136–147	145–155	152–166
5	11	139–150	148–158	155–169

IDEAL WEIGHTS FOR MEN AGED 25 AND OVER*

HEIGHT (WITH SHOES)		WEIGHT IN POUNDS (AS ORDINARILY DRESSED)		
Ft.	In.	Small Frame	Medium Frame	Large Frame
5	2	116–125	124–133	131–142
5	3	119–128	127–136	133–144
5	4	122–132	130–140	137–149
5	5	126–136	134–144	141–153
5	6	129–139	137–147	145–157
5	7	133–143	141–151	149–162
5	8	136–147	145–156	153–166
5	9	140–151	149–160	157–170
5	10	144–155	153–164	161–175
5	11	148–159	157–168	165–180
6	0	152–164	161–173	169–185
6	1	157–169	166–178	174–190
6	2	163–175	171–184	179–196
6	3	168–180	176–189	184–202

* Metropolitan Life Insurance Company

Tests Concerned with Diabetes Mellitus; Insulin Administration

TESTS FOR SUGAR AND DIACETIC ACID IN THE URINE

The urine of a diabetic may contain appreciable amounts of those products which the body cannot metabolize. For this reason urinary tests are a convenient criterion for judging the severity of the disease or the success of its treatment The nurse and the patient should both know how to make simple tests for sugar and diacetic acid Sometimes these are made on samples of urine taken from a single voiding, sometimes on group urines, and occasionally on a 24-hour specimen. It is significant for the physician to know at what hours of the day sugar is being excreted in order that he may adjust the insulin dosage accordingly. *Urine from chemically regulated* diabetics should contain no more than a trace of sugar Urine from clinically treated diabetics may contain small amounts or a trace of sugar. The excretion of acetone or diacetic acid by a diabetic, regardless of the type of dietary management, is considered to be a danger signal

Collection of Urine

24 Hour Specimen

The urine voided at 7 A M should be discarded. All urine voided during the

venient One teaspoonful of toluol may be added as a preservative

Periodic Specimens

The physician may request a sugar test on urine voided before and after meals or at certain times of the day In this case the samples are kept separately and preferably tested immediately.

Group Urines

Still another method of determining when sugar is spilled into the urine is to *collect specimens during stated periods* of time. This may be from 7 A.M to 11 A M, discarding the 7 A M specimen, from 11 A M to 3 P M; from 3 P M to 11 P M, from 11 P M. to 6 A M; and from 6 A M to 7 A.M, including the 7 A M voiding

Benedict Qualitative Test for Sugar

Equipment Necessary

Test tubes—3 or more
Teaspoon
Medicine dropper
Gas burner or alcohol lamp
Benedict's qualitative solution

Directions for the Test

Place 5 cc. (1 teaspoon) of Benedict's solution in a test tube and, with a dropper, add exactly 8 drops of the urine to be tested. Shake gently and heat over a free flame, allowing it to boil 1 minute The tube may be heated in vigorously boiling water for 5 minutes

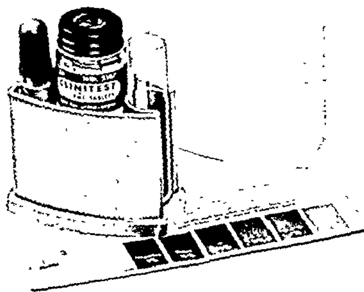


Fig 138 Clinitest set for easy estimation of the amount of sugar present in the urine. It is accurate enough for clinical purposes. Directions for use are included in the text and accompany the set (Ames Company, Inc., Elkhart, Ind)

with the same results Allow the tube to cool spontaneously. The following color reactions indicate the amount of sugar present

Clear blue no change from the original solution = sugar free

Green slight sediment on standing = trace of sugar present or 1+

Yellow or yellowish green yellow sediment = 1 per cent of sugar or 2+

Greenish brown = more than 1 per cent sugar or 3+

Red or reddish brown, heavy sediment = more than 2 per cent of sugar present or 4+

Test tubes must be cleaned thoroughly after each test. A test-tube brush will be most convenient for this purpose.

Benedict's qualitative solution may be purchased from hospital laboratories, drugstores or diabetic supply houses, or may be made according to the following directions

Benedict's Solution

	GM OR CC.
Copper sulfate (pure crystallized)	17.3
Sodium or potassium citrate	173 0
Sodium carbonate, crystallized. (If the anhydrous sodium carbonate is used, only one half of this amount should be taken)	200 0
Distilled water, to make	1000.0

The citrate and the carbonate are dissolved together with the aid of heat in about 700 cc. of water. The mixture is poured (through a filter, if necessary) into a large beaker. The copper sulfate is dissolved separately in about 100 cc. of water and is poured slowly into the first solution, with constant stirring. The mixture is cooled and diluted to 1 liter. *This solution will keep indefinitely.*

Several modifications for testing the urine for sugar have been developed, making them convenient for home and office use and for travel. One of these is Clinitest, a commercial preparation (Fig 138). It consists of a tablet containing Benedict's copper reagent plus a chemical which brings the solution to a boil when 5 drops of urine and 10 drops of water are added The color readings are those of the Benedict test described above.

Test paper strips are also available. The color reactions are on a different scale, and the method is not as accurate as those using Benedict's solution

Gerhardt's Test for Diacetic Acid

Diacetic acid is only one of the three abnormal products which may appear in the urine as a result of the incomplete utilization of fat. It is the simplest one to detect.

Directions for the Test

To about 10 cc. of fresh urine in a test tube carefully add a few drops of a concentrated solution of ferric chloride, one drop at a time. A wine-red color indicates the presence of diacetic acid. Con-

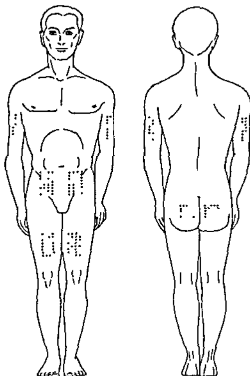


Fig. 139. Insulin sites (Adapted from Joslin, E P.: Diabetic Manual, Philadelphia, Lea & Febiger)



Fig 140 To mix protamine zinc or NPH insulin, the insulin bottle should be rolled gently between the palms of the hands, but not shaken, to produce uniform distribution of the sediment without frothing (Rosenthal and Rosenthal Diabetic Care in Pictures, ed. 2, Philadelphia, Lippincott)



Fig 141 After inserting the needle through the rubber cap of the insulin bottle, invert the bottle, force the air in the syringe into the bottle and withdraw the needed amount of insulin. (Rosenthal and Rosenthal: Diabetic Care in Pictures, ed. 2, Philadelphia, Lippincott)

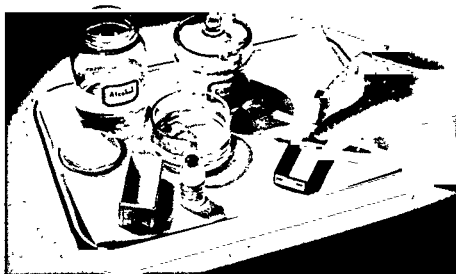


Fig 142. The syringe, which is now filled with insulin, should be put down carefully so that the needle on the syringe does not touch the hand or any object. The cover of the syringe box with its cutouts is a good resting place for the syringe until the skin is sterilized for the injection of insulin. (Rosenthal and Rosenthal Diabetic Care in Pictures, ed. 2, Philadelphia, Lippincott)

drugs, it will persist. Pour a portion of the red solution into a second test tube and heat in boiling water for 5 minutes. Compare the two tubes to determine whether or not the color has faded.

A simpler method for performing this test is by use of Acetest,[1] a commercially prepared tablet which will give a color reaction in the presence of acetone when a drop of urine is placed on the tablet.

DIRECTIONS FOR THE ADMINISTRATION OF INSULIN

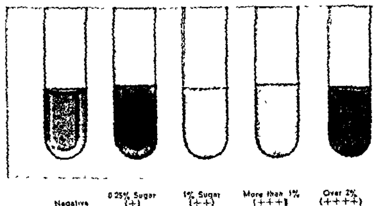
Insulin cannot be given by mouth because, being a protein-like substance, it is destroyed by the digestive enzymes. It is, therefore, given subcutaneously by means of a hypodermic needle and a syringe.

Insulin is sold in small rubber-capped vials labeled plainly as to the number of units of insulin in 1 cc of the solution. (One cc of U 40 contains 40 units; 1 cc of U 80 contains 80 units.) Read the label carefully and follow accurately the

safe to use a syringe graduated in units to correspond with the strength of insulin used. Thus, U 40 insulin is used with a syringe graduated to U 40 only and without a double graduation. For the rare patient needing more than 80

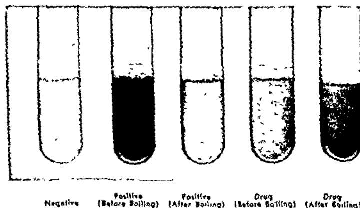
[1] Ames Company, Inc, Elkhart, Ind.

PLATE 4



Quantitative estimation from the Benedict qualitative test for sugar in urine (Eli Lilly and Company)

PLATE 5



Test for acetoacetic (diacetic) acid Gerhardt's test (Eli Lilly and Company)



Fig 141 The left hand is used to pinch a large amount of flesh, the center of which is to be used for the injection With the flesh thus held firmly, the needle can be injected more easily (Rosenthal and Rosenthal Diabetic Care in Pictures, ed 2, Philadelphia, Lippincott)

a 25 to 26 gauge needle about ¾ inch [illegible]

A. *Sterilization of Equipment*

1 Wash the hands thoroughly with soap and water

2 Place the separate parts of the syringe and the needle with the wire removed in a large strainer set in a pan of water. Be sure the equipment is covered with water

3 Bring water to a boil When it is bubbling, boil 5 minutes

4 Lift out strainer with equipment and pour water out of pan Replace strainer with equipment in pan and allow to cool by standing

5 If protamine zinc or NPH insulin is used, roll the insulin bottle gently between the palms of the hands in order to produce uniform distribution of the sediment without frothing

6 Wipe the rubber cap of the insulin bottle with cotton dipped in 70 per cent alcohol.

B *Loading the Syringe*

1. Insert piston into the barrel without touching the cylinder of the piston Fit the needle firmly onto the barrel without touching the point Draw out the piston to the amount of insulin prescribed

2 Push the needle through the rubber cap of the insulin bottle until the point is just visible.

3 Invert the bottle and force all the air in the syringe into the bottle.

4 Withdraw a trace more insulin than is needed

5 Before removing the needle from the bottle, and while the bottle is still inverted, expel the air or extra insulin, bringing the piston exactly to the proper insulin dosage.

6. Place the filled syringe in the grooves of the cover of the box which contained the insulin, being careful not to contaminate the point of the needle.

C. *Injecting the Insulin*

Insulin is best injected where the skin is relatively loose. the outside of the upper arm and the front of the thigh. It may also be given in the buttocks or under the skin of the abdomen. It is best to administer successive doses in different places.

1. Sterilize the skin at the place chosen for injection by rubbing it gently with the cotton soaked in alcohol which was used to sterilize the cap of the insulin bottle.

2. Pinch and lift up a section of [illegible]

pushing the plunger and withdrawing the needle slowly to avoid leaving all the insulin in one spot.

4. Rub the spot with the alcohol sponge.

D. *Care of Equipment*

1. Keep the insulin in a refrigerator

2. Wash syringe and needle in cold water immediately. Warm water and soap may occasionally be necessary. Rinse thoroughly.

3. Allow syringe and needle to air-dry. Reassemble the equipment and force some air through the needle a few times to dry it. Separate the equipment and replace the fine wire in the needle

4. Store in a dry, clean place.

INSULIN MIXTURES

Sometimes a dosage of both a short- and a longer-acting insulin is prescribed. These may be given separately, one in *each arm or leg, or they may be mixed* and given as one injection, using the following procedure:

1 Withdraw the prescribed number of units of regular or crystalline insulin into the syringe.

2 Using the same needle and syringe, withdraw the prescribed number of units of protamine zinc insulin.

3 Inject the mixture under the skin in the usual manner.

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Glossary

The pronunciation follows the system of Webster's New International Dictionary, second edition

acetone bodies (ăs'ē-tōn) Acetone, diacetic acid and beta-hydroxybutyric acid Called also ketone bodies (*See* ketosis, defined below)

achlorhydria (ā'klōr-hī'drĭ-*a*) Absence or diminished amount of hydrochloric acid in the gastric secretions.

achylia gastrica (ā-kī'lĭ-*a* găs'trĭ-k*ă*) A condition in which the secretion of gastric juice is diminished or absent

acidosis (ăs'ĭ-dō'sĭs) A condition in which the body's alkaline reserve is lowered, due to abnormal loss of alkaline salts or abnormal accumulation of acids

acne (ăk'nē). A chronic inflammatory disease of the sebaceous glands, occurring most frequently on the face, the back and the chest

acrodynia (ăk-rō-dĭn'ĭ-*a*) An eruptive skin disease In humans, it is marked by pain in the soles of the feet and the palms of the hands

ACTH (ā-c-t-h) adrenocorticotropic hormone [illegible]

[illegible] from the blood and the bone marrow.

albuminuria (ăl-bū-mĭ-nū'rĭ-*a*) The presence of albumin in the [illegible]

allergen (ăl'ẽr-jĕn) Any substance capable of inducing allergy

alopecia (ăl'ō-pē'shĭ-*a*) Baldness, deficiency of hair

amino acid (ă-mē'nō ăs'ĭd) A class of organic compounds known as the building blocks of the protein molecule

amylase (ăm'ĭ-lās) An enzyme that digests starch, as ptyalin in the saliva

anaphylaxis (ăn'*a*-fĭ-lăk'sĭs). Unusual or exaggerated reaction or shock of the organism to foreign protein

anastomosis (*a*-năs'tō-mō'sĭs) A communication between two vessels, a surgical formation of a passage between two vessels

anorexia (ăn'ō-rĕk'sĭ-*ă*) Lack or loss of appetite for food

antibiotic (ăn'tĭ-bī-ot'ĭk) A substance which inhibits growth and multiplication of bacteria

antihemorrhagic (ăn'tĭ-hĕm'ŏ-răj'ĭk) Stopping hemorrhage Often applied to vitamin K

antineuritic (ăn'tĭ-nū-rĭt'ĭk) Counteracting neuritis Often applied to thiamine

antirachitic (ăn'tĭ-r*ă*-kĭt'ĭk) Preventive, curative or corrective of rickets. Often applied to vitamin D

antiscorbutic (ăn'tĭ-skôr-bū'tĭk) Correcting or curing scurvy. Often applied to ascorbic acid

antivitamin (ăn'tĭ-vī'tă-mĭn). A substance which may inactivate or destroy a vitamin

anuria (ă-nū'rĭ-*ă*) Absolute suppression of urinary secretion

arachidonic acid (ăr'ā-kĭ-dŏn'ĭk ăs'ĭd). An unsaturated fatty acid, essential for normal nutrition.

arteriosclerosis (ăr-tē'rĭ-ō-sklē-rō'sĭs) A

thickening and a hardening of the walls of arteries and capillaries.

ascites (ă-sī'tēz) Accumulation of fluid in the abdominal cavity.

ascorbic acid (ȧ-skôr'bĭk) Vitamin C, deficiency of which is a causative factor in scurvy

aspiration (ăs'pĭ-rā'shŭn). The act of breathing or drawing in

assay (ă-sā'). Examination or analysis of a substance.

asthenia (ăs-thē'nē-*a*) Without strength

atherosclerosis (ăth'ĕr-ō-sklē-rō'sĭs) Fatty degeneration of the connective tissue of the arterial walls

atonic (*a*-tŏn'ĭk). Lack of normal tone or vigor of an organ or part.

atrophy (ăt'rō-fĭ). A wasting away of a cell, tissue, organ or part.

avidin (*a*-vĭ-dĭn) A proteinlike substance isolated from egg white.

avitaminosis (ā-vī'*ta*-mĭn-ō'sĭs) A condition due to the lack or the deficiency of a vitamin in *the diet, or to lack of absorption* or utilization of it.

bactericidal (băk-tēr'ĭ-sīd'ăl) Destructive to bacteria

bacteriostatic (băk-tēr'ĭ-ō-stăt'ĭk) Inhibitive to growth of bacteria

base (bās) A substance which combines with acids to form neutral compounds

benign (bē-nīn'). Mild, favorable for recovery.

bio-assay (bī'ō-ă-sā') Examination or analysis of a substance by noting its effect on animals

biotin (bī'ō-tĭn). A member of the vitamin *B complex*

botulism (bŏt'ū-lĭz'm) Poisoning from the toxin produced by the organism *Clostridium botulinum* The toxin has a selective action on the nervous system

bradycardia (brăd'ĭ-kar'dĭ-*a*) Abnormal slowness of the heartbeat

calciferol (kăl-sĭf'ĕr-ōl) Vitamin D_2, produced by irradiating ergosterol

calcification (kăl'sĭ-fĭ-kā'shŭn) Process by which organic tissue becomes hardened by a deposit of calcium salts

calculus, pl calculi (kăl'kū-lŭs). Commonly called stone.

calorimeter (kăl'ō-rĭm'ē-tēr). An instrument for measuring the heat change in any system (such as the types pictured in Chapter 5, one of which is used to measure the amount of heat produced by the body), and the bomb calorimeter used to measure the calorie (energy) value of foods

carotene (kăr'ō-tēn). A yellow pigment which exists in several forms, alpha, beta and gamma carotene are provitamins which may be converted into vitamin A in the body.

casein (kā'sē-ĭn). The principal protein of milk, the basis of cheese

cheilosis (kī-lō'sĭs) A condition marked by lesions on the lips and cracks at the angles of the mouth.

cholecystitis (kŏl'ē-sĭs-tī'tĭs). Inflammation of the gallbladder.

cholecystokinin (kō'lē-cyst'ō-kī'nĭn) A hormone produced in the wall of the duodenum in the presence of fat, which stimulates the contraction of the gallbladder.

cholelithiasis (kŏl'ē-lĭ-thī'*a*-sĭs) The presence or formation of gallstones

cholesterol (kō-lĕs'tĕr-ōl). The most common *member of the sterol group, defined* below

choline (kō'lēn) A component of lecithin Necessary for fat transport in the body. Prevents the accumulation of fat in the liver.

chyme (kīm). The thick, grayish, semiliquid mass into which food is converted by gastric digestion. In this form it passes into the small intestines.

cirrhosis (sĭ-rō'sĭs). Inflammation with hardening of the tissues of an organ, more especially the liver

citrovorum factor (sĭt'rō-vō'rŭm făk'tēr) A vitamin belonging to the B complex *closely related to vitamin* B_{12}.

cobalamine (kō'bôl-ăm'ĭn). The basic molecule of vitamin B_{12}, several compounds

organic substance of bones changeable by boiling into gelatin.

colloidal (kŏ-loi'dăl) Pertaining to a colloid, which is a substance containing tiny, solid, evenly dispersed particles not dissolved in the medium, but which will not settle out Glue is an example.

congenital (kŏn-jĕn'ĭ-tăl). Existing at or before birth.

cortex (kôr'tĕks) The outer layers of an organ as distinguished from its inner substance

cortisone (côr'tē-sōn) A synthetic, hormone-like substance, similar to the adrenal cortex hormones

enzymes

cystitis (sĭs-tī'tĭs) Inflammation of the urinary bladder.

deamınization (dē-ăm'ĭn-ĭ-zā'shŭn) The process of metabolism by which the nitrogen portion (amine group) is removed from amino acids

dehydration (dē'hī-drā'shŭn) Removal of water from the body or a tissue

dermatitis (dûr'mа-tī'tĭs) Inflammation of the skin

desoxycorticosterone (dĕs-ŏx'ē-cŏrt'ē-cō-stĕr'ōn) A hormone produced by the

urine

dysentery (dĭs'ĕn-tĕr-ĭ) Inflammation of intestinal mucous membrane, especially the colon The causative agent may be bac-

breathing

dystrophy (dĭs'trō-fĭ). Progressive weakening of a muscle.

eclampsia (ĕk-lămp'sĭ-a) A sudden attack of convulsions A severe manifestation of toxemia of pregnancy

eczema (ĕk'zē-ma). A skin disease

edema (ē-dē'ma). An accumulation of large amounts of fluid in the intertissue spaces of the body

electrolyte (ē-lĕk'trō-lıt) The ionized form of an element Common electrolytes in the body are sodium, potassium and chlorides

emaciation (ē-mā'sĭ-ā'shŭn). A wasted condition of the body.

emulsion (ē-mŭl'shŭn). A finely divided mixture or suspension of two liquids not mutually soluble

endemic (ĕn-dĕm'ĭk) Pertaining to or prevalent in a particular district or region

endocarditis (ĕn'dō-kar-dī'tĭs) Inflammation of the endocardium (inner lining membrane of the heart)

endocrine (ĕn'dō-krĭn) Applied to organs whose function it is to secrete internally a substance which plays an important role in metabolism

endogenous (ĕn-dŏj'ē-nŭs). Originating within the organism

enzyme (ĕn'zīm) A substance, frequently protein in nature and formed in living cells, which brings about chemical changes

epithelium (ĕp'ĭ-thē'lĭ-ŭm) The outer layers of the skin and the mucous membranes, consisting of cells of various forms and arrangement

ergosterol (ĕr-gŏs'tĕr-ōl) A sterol found in plant and in animal tissues which, on exposure to ultraviolet light, is converted into vitamin D_2 (*See* sterol)

erythrocyte (ē-rĭth'rō-sīt). Red blood corpuscle

etiology (ē'tĭ-ŏl'ō-jĭ) The study of the causation of a disease

exogenous (ĕks-ŏj'ē-nŭs). Originating outside the organism

extractive (ĕx-trăk'tĭv) Any substance present in a tissue or in a mixture in a small quantity, and requiring to be extracted by a special method

extrinsic (ĕks-trĭn'sĭk) Coming from, or originating from, outside.

fatty acids (făt'ĭ ăs'ĭds) The organic acids which combine with glycerol to form fat.

febrile (fē'brĭl). Pertaining to, or accompanied by, fever

feces (fē'sēz) Excrement, the discharge of the bowels.

ferment (fûr'mĕnt) An enzyme, defined above

fetus (fē'tŭs). The product of conception after the fourth month of pregnancy.

fibrosis (fī-brō'sĭs) The formation of fibrous connective tissue.

fistula (fĭs'tu-la) An abnormal tube-like passage in the body.

flatulence (flăt'ū-lĕns). Distention of the in-

complex group, known also as pteroylglutamic acid

friable (frī'ȧ-b'l) Easily broken or crumbled.

gastrectomy (găst'rĕk'tȯ-mĭ). Surgical removal of a part or all of the stomach.

gavage (gȧ'vazh'). Feeding by the stomach tube.

geriatrics (jĕr'ĭ-ăt'rĭks) Study and treatment of the problems and the diseases of old age.

in wheat

glossitis (glŏs-ī'tĭs). Inflammation of the tongue.

glucagon (glōō'kă-gŏn) A hormone produced by the pancreas which breaks down liver glycogen to glucose.

gluten (glōō'tĕn;-t'n) A protein found in *many* cereal grains.

glyceride (glĭs'ĕr-īd) A compound formed when glycerin and an acid are combined.

glycogen (glī'kȯ-jĕn). A carbohydrate, similar in composition to starch In this form, carbohydrate is stored temporarily in the liver and the muscles.

glycosuria (glī'kȯ-sū'rĭ-ȧ). Presence of sugar in the urine.

hemeralopia (hĕm'ĕr-ȧ-lō'pĭ-ȧ) Day blind-

breaking down of red blood corpuscles

stance in the body, *found wherever tissues* are damaged A stimulator of the

ported to another organ, where it produces a specific effect.

hydrolysate (hī-drŏl'ĭ-săt). A product of hydrolysis. Often applied to protein.

hydrolysis (hī-drŏl'ĭ-sĭs). A chemical reaction in which a compound is broken down with the chemical addition of water and the formation of a new compound.

hyperchlorhydria (hī'pĕr-klōr-hī'drĭ-ȧ) Excessive secretion of hydrochloric acid in the stomach.

hypercholesteremia (hī'pĕr-kȯ-lĕs'tĕr-ē'mĭ-ȧ) *Excess of cholesterol in the blood.*

hyperemia (hī'pĕr-ē'mē-ȧ). A congestion of blood.

hyperplasia (hī'pêr-plā'zhĭ-ȧ; -zĭ-ȧ) Abnormal multiplication of cells, with increase in size of the organ, but without formation of a tumor.

hyperthermia *(hī'pĕr-thûr'mĭ-ȧ). Fever.*

hypertrophic (hī'pĕr-trŏf'ĭk). Pertaining to an enlargement or overgrowth of an organ, or part, due to a diseased condition.

hypocalcemia (hī'pȯ-kăl-sē'mē-ȧ). Abnormally low blood calcium

hypochlorhydria (hī'pȯ-klōr-hī'drĭ-ȧ) Diminished secretion of hydrochloric acid in the stomach.

protein in the blood

hypoprothrombinemia (hī'pȯ-prȯ-thrŏm'-bĭn-ē'mē-ȧh). Deficiency of prothrombin in the blood.

icterus (ĭk'tĕr-ŭs) Jaundice.

idiopathic (ĭd'ĭ-ȯ-păth'ĭk) Self-originated, occurring without known cause

ileitis (ĭl'ē-ī'tĭs) Inflammation of the ileum

ileum (ĭl'ē-ŭm) Lower third portion of the small intestine About 12 feet long.

incipient (ĭn-sĭp'ĭ-ĕnt) Beginning to exist

inositol (ĭn-ō'sĭ-tōl). A member of the vitamin B complex.

interstitial (ĭn'tĕr-stĭsh'ăl). In the spaces between the cells.

intravenous (ĭn'tra-vē'nŭs) Within or into a vein.

intrinsic (in-trin'sik) Situated entirely within, pertaining to itself.

isotopes (ī'sō-tōps) Two or more chemical elements which have the same atomic number and identical chemical properties, but which differ in atomic weight or in the structure of the nucleus

jejunum (jē-ōō'nŭm) Middle portion of the small intestine. About 8 feet long

keratinize (kĕr'ā-tin-iz) To become horny-like

ketosis (kē-tō'sis) A condition in which there is an accumulation in the body of the ketone bodies (*See* acetone bodies) as a result of incomplete oxidation of the fatty acids

kwashiorkor (kwa-shī-ŏr'kĕr). A severe protein deficiency disease occurring in small children Endemic in many parts of the world

labile (lā'bĭl) Not fixed, unstable.

lacteal(s) (lăk'tē-ăl) Tiny vessels in the intestinal wall through which fat is ab-

leukemia (lū-kē'mĭ-ā). A disease of the blood-forming organs, characterized by a marked increase of the white corpuscles

leukocyte (lū'kō-sīt). White blood corpuscles

leukopenic (lū'kō-pĕn'ĭk). Pertaining to leukopenia (reduction of leukocytes in the blood)

linoleic acid (lin'ō-lē'ĭk ăs'ĭd) An unsaturated fatty acid essential for nutrition.

linolenic acid (lin'ō-lē'nik ăs'ĭd) An unsaturated fatty acid essential for nutrition.

lipase (lī'pās, lĭp'ās) An enzyme that digests fat

lipid (lĭp'ĭd), lipoid (lĭp'oid) Fat or fat-like substances.

lipoprotein (lĭp'ō-prō'tē-in) Combination of a protein with a fat found in both animal and plant tissues.

lipotropic (lĭp'ō-trŏp'ĭk) Applied to substances essential for fat metabolism.

lumen (lū'mĕn) The space within an artery, vein, intestine or tube.

macrocyte (măk'rō-sīt) Abnormally large

work of a tissue

menadione (mē-nā-dī'ōn). Synthetic vitamin K

metabolism (mĕ-tăb'ō-lĭz'm) General term to designate all chemical changes which occur in living matter These changes are of two types—constructive and destructive

methionine (mĕth-ī'ō-nin) An essential amino acid important for its influence on fat metabolism

microcyte (mī'krō-sit) An undersized red

intestinal tract

myocarditis (mī'ō-kar-dī'tis) Inflammation of the myocardium (heart muscle)

myosin (mī'ō-sin). A protein of muscle plasma

myxedema (mĭk'sē-dē'mā) Condition due to a deficiency of thyroid secretion.

nasogastric tube (nā'zō-găs'trik tūb). Tube inserted through the nose and passed by way of the esophagus into the stomach.

necrosis (nĕ-krō'sis) Death of a circumscribed area of tissue

neoplasm (nē'ō-plăz'm) Any new and abnormal growth such as a tumor.

neurasthenia (nū'răs-thē'nĭ-ā) Nervous exhaustion characterized by abnormal fatigue

cells

nyctalopia (nĭk'tā-lō'pĭ-ā). Night blindness, imperfection of vision at night or in a dim light.

ophthalmia (ŏf-thăl'mĭ-*a*) Severe inflammation of the eye.

osmotic pressure (ŏs-mŏt'ĭk). Unbalanced pressure, causing the phenomenon of

bone or bony substance

osteomalacia (ŏs'tē-ō-m*a*-lā'shĭ-*a*) Softening of the bone due to loss of calcium Occurs chiefly in adults.

oxidation (ŏk'sĭ-dā'shŭn) A chemical process by which a substance combines with oxygen. In the body the rate of oxidation depends upon cell activity, not the intake of oxygen

pantothenic acid (păn'tō-thĕn'ĭk) A member of the vitamin B complex.

parenchyma (p*a*-rĕng'kĭ-m*a*) The functional part of an organ as distinguished from its framework.

para-aminobenzoic acid (păr'a-*a*-mē'nō-bĕn-zō'ĭk ăs'ĭd) A vitamin of the B complex group, a deficiency of which results in graying of dark hair of rats and other animals

parenteral (păr-ĕn'tĕr-*a*l). Not through the alimentary canal, i e, subcutaneously or intravenously.

parturition (pär-tū-rĭsh'ŭn). The act or process of giving birth to a child

peptide (pĕp'tid, -tĭd) An intermediary product of enzymatic hydrolysis of protein

propels its contents

pernicious (pĕr-nĭsh'ŭs) Tending to be serious or fatal

phagocytosis (*făg'ō-sĭ-tō'sĭs*). The engulfing of micro-organisms and cells by phago-

white blood corpuscles or

lution of sodium chloride isotonic with the blood.

polycythemia (pŏl'ĭ-sĭ-thē'mĭ-*a*) Excess of red corpuscles in the blood.

polydipsia (pŏl'ĭ-dĭp'sĭ-*a*). Excessive thirst.

polyneuritis (pŏl-ĭ-nu-rī-tĭs) Inflammation of many nerves.

polyphagia (pŏl'ĭ-fā'jĭ-*a*) Excessive hunger.

polyuria (pŏl'ĭ-ū'rĭ-*a*). Excessive secretion and discharge of urine.

precursor (prē-kûr'sĕr). A substance which is converted into another

premature infant (prē'm*a*-tur'). An infant born before term

prognosis (prŏg-nō'sĭs). Prospect as to recovery from a disease.

prophylaxis (prō'fĭ-lăk'sĭs) The prevention of *disease*.

protease (prō'tē-ās) An enzyme that digests protein

protein hydrolysate (prō'tē-ĭn hī-drŏl'ĭ-zāt). A solution containing the constituent amino acids of an artificially digested protein, usually milk or beef protein

proteinuria (prō'tē-ĭ-nū'rĭ-*a*) Presence of protein in the urine.

proteolytic (prō'tē-ō-lĭt'ĭk). Effecting the digestion of proteins

proteose(s) (prō'tē-ōs) An intermediate product of enzymatic hydrolysis of protein between protein and peptone.

protoplasm (prō'tō-plăz'm). The essential *living matter in a cell The only known* form of matter in which life is manifested

provitamin (prō'vī't*a*-mĭn) The forerunner of a vitamin Provitamin A is carotene.

pteroylglutamic acid (tĕr-ōl-glū-tăm'ĭc ăs'ĭd) *(See folic acid)*

ptyalin (tī'*a*-lĭn) The amylase of saliva.

purine(s) (pū'rēn) End products of nucleoprotein metabolism.

putrefaction (pū'trē-făk'shŭn) The decomposition of animal matter, especially protein, caused by certain kinds of bacteria

pyelitis (pī'ĕ-lī'tĭs) Inflammation of the pelvis of the kidney.

pyridoxine (*pĭ-rĭ-dŏk'sĭn*) *Vitamin* B_6, a member of the vitamin B complex.

radiography (rā'dĭ-ŏg'r*a*-fĭ) Photography with the roentgen rays. The making of x-ray pictures

remission (rē-mĭsh'ŭn) The period of abatement of symptoms, or the lessening of their severity

renal (or kidney) threshold (rē'năl thrĕsh'ōld).

[illegible]

blood cell

retina (rĕt'ĭ-na) Innermost and the perceptive structure of the eye, formed by the expansion of the optic nerve.

riboflavin (rī'bō-flā'vĭn). Vitamin B_2 or G, heat-stable factor of B complex.

saponification (sa-pŏn'ĭ-fĭ-kā'shŭn) The splitting of fat by an alkali, yielding glycerol and soap This may occur during the digestion of fat

satiety (sa-tī'ĕ-tĭ) Fullness or gratification of appetite

sclerosis (sklē-rō'sĭs). Hardening, a chronic thickening of a part due to inflammation and disease

spasmophilia (spăz'mō-fĭl'ĭ-a) A tendency to spasm and convulsions.

spastic (spăs'tĭk) Characterized by spasms or convulsions

sphincter (sfĭngk'tĕr) A ringlike muscle which closes a natural opening

stasis (stā'sĭs) A stoppage of the flow of blood or other body fluid in any part

steatorrhea (stē'a-tō-rē'a) Presence of an excess of fat in the stools.

sterol (stĕr'ōl) Fat-soluble substances of a complex molecular structure

stomatitis (stō-ma-tī'tĭs) Inflammation of the mouth

suet (sū'ĕt) Hard fat of beef and mutton

syndrome (sĭn'drōm) A set of symptoms which occur together.

synthesis (sĭn'thē-sĭs) The process of building up a chemical compound.

tetany (tĕt'a-nĭ) A condition characterized by intermittent spasms, muscle twitchings and cramps usually involving the extremities

thiamine (thī'ăm-ĭn). Vitamin B_1 Antineuritic factor.

thiochrome (thī'ō-krōm). The yellow coloring matter of yeast It may be prepared by oxidizing thiamine

tocopherol (tō-kŏf'ĕr-ōl) An alcohol-like substance which has the properties of vitamin E

toxemia of pregnancy (tŏks-ē'mē-a prĕg'-năn-sē) A toxic condition of unknown etiology which occurs only in pregnancy.

trauma (trô'ma) An injury or a wound

trichinosis (trĭk'ĭ-nō'sĭs) A disease due to infection with trichinae—parasites found in raw pork

trimester (trī-mĕs'tĕr) A period of three months

trypsin (trĭp'sĭn) An enzyme that digests protein

ultraviolet light (ŭl'tra-vī'ō-lĕt) Rays of shorter wave length than visible light Sunlight is the natural source, but it may be derived from various kinds of electrical devices

urea (ū-rē'a) The chief nitrogenous end product of protein metabolism in the body

uremia (ū-rē'mĭ-a) Toxic condition produced by the presence of urinary constituents (waste products) in the blood.

urobilinogen (ū'rō-bī-lĭn'ō-jĕn) An excretory product in the urine derived from one of the bile pigments Bile pigments are derived from degenerated hemoglobin

urticaria (ûr'tĭ-kā'rĭ-a) Hives, nettle rash.

vascular (văs'kū-lĕr) Pertaining to, or full of, blood vessels

viosterol (vī-ŏ'stĕr-ōl) A solution of irradiated ergosterol in oil, vitamin D_2.

xerophthalmia (zē'rŏf-thăl'mĭ-a) A dry and lusterless condition of the eyes resulting from a vitamin A deficiency.

zein (zē'ĭn) A protein obtained from corn.

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